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The Farmer's Digest

Volume 13 December, 1949 Number 8

'Feedlot' Pasture—647 lb. per acre

Condensed from Western Livestock Journal

Robert L. Rutter, Jr.

Supervisor, Kittitas Soil Conservation District

A PASTURE with the "new look," a venture of Washington's Kittitas Soil Conservation District, is exciting more comment among farmers in the Kittitas Valley than the prize sires being added to beef herds. This latest model pasture in 1948 added an average of 647 lb. per acre to the yearling white face steers that grazed it. That's more than double the beef that the average native irrigated pastures were turning out. And fully as significant is the fact that the cost of the beef produced was only $6.76 per 100 lb.

In the Kittitas Valley farmers pretty much had taken their pastures for granted, paying little attention to them or to the number of pounds of beef or milk they made a year.

But supervisors of the Kittitas Soil Conservation District weren't content to let it go at that. The goal of the farmers who run the soil conservation district is proper use of every acre in the valley.

We began to wonder what an improved pasture would yield in terms of pounds of beef if managed properly. We looked all over the valley for the answer, but couldn't find it. No farmer was doing all the things the soil conservation and pasture experts recommended. Many farmers were applying some portion or fragment of the recommended program, and were pleased with the results.

So those of us on the board decided to get the whole answer. We started in the fall of 1945 when we leased 41 acres of ground for 5 years. Today, we have proved to the farmers in the Kittitas Soil Conservation District that they can make 600 lb. of beef per acre a year from

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Los Angeles, California

improved pasture, managed in the right way.

That compares pretty well with the best irrigated pastures I've read about where the growing season runs nearly the year around.

Here in the Kittitas Valley the average number of frost free days is around 143, and the native irrigated pastures, the best of them, were doing well to make 300 lb. of beef per acre a year.

We got the ideas of the experts before we launched our undertaking. The Washington State College Extension Service and Experiment Station were glad to lend a hand because in addition to offering something they, too, would get answers quickly and cheaply. The grass experts of the Soil Conservation Service nursery and agronomy divisions offered their suggestions. And Waldo Passmore, the Kittitas county agent, and Arthur E. Miller of the Soil Conservation Service office assigned to the district, were eager to help.

The soil of the demonstration pasture ground wasn't the most fertile and well drained in the valley. But it offered problems representative of those that are the rule on approximately one-third of the 100,000 acres of irrigated land in the valley.

Most of the topsoil on the pasture is loam and gravelly loam. It is 18 to 26 inches deep. Underneath there is loose gravel and rock. In fact, a rockbar, in which the stones on the surface are bigger than half gallon buckets, occupies several acres of the lower part of the field.

But the gravel and rocks weren't the only major obstacles. All the ground had a high water table. For example, in the middle part of the pasture the water table was within a foot of the surface in the spring. In the lower end, water actually stood on a large part of the surface.

So the first thing that needed correction was drainage. We had 600 feet of covered drain put in across the upper part of the field and 800 feet of open ditch drain across the lower portion. Along part of the field, the county road ditch was cleaned to further improve the drainage. We used the district dragline to dig the channels. This took care of the drainage end of the job nicely.

The land had been in native pasture for a number of years, but in 1945 the better drained upper half had been seeded to oats. Grasses in the native pasture included bluegrass, red top, a lot of quackgrass, sedges and wire grasses.

Everbody agreed that the next thing that must be done was to get rid of the quack and bluegrass to make ready for the new seeding. But disagreement arose among the experts on the best and

surest way of getting the job done.

Some of the experts wanted to fallow the ground in 1946 and seed it to oats in 1947 to get the job done. Others thought that the weed grasses could be killed in 1946 if worked often enough. We thanked both camps for their suggestions and decided to fallow the ground in 1946.

On the upper half of the field, which by the way is divided from the lower half, by a road, we had the oats stubble worked four times with a field cultivator and then gave it five additional cultivations with a duckfoot cultivator.

In the lower half, which was in sod, we had the field worked four times with a field cultivator. Then it was plowed and disked twice. After that we had it gone over with a duckfoot eight times, in that way keeping the sod being killed on top, not burying it.

Formerly the irrigation method employed was wild flooding. In other words, the water was turned on and spread over the field. But the land was far from smooth. Under that system the high ground didn't get enough water and the low ground got too much.

So the district plan called for leveling the whole pasture to provide uniform distribution of water. Again district equipment was used. Cuts of six inches or more were made on approximately 15 acres scattered here and there through the fields.

Most of the experts today agree that the intensive cultivation the district pasture got in 1946 killed out the old sod to the same degree that would have been achieved by seeding the land two or three years to grain or row crops.

The seeding used was also a compromise of the recommendation of the experts. It consisted of smooth brome, English rye, tall oat, orchard grass, alta fescue, alsike clover and ladino clover, with oats as a nurse crop.

The new irrigation system is laid out so there are 330 feet between head ditches and 36 inches between corrugations. Beginning on August 23, 1946, the land was rolled, seeded, corrugated and irrigated. Following the irrigation, the land was fertilized with 18% superphosphate at the rate of 300 lb. per acre.

A good stand of clovers and grasses came through the winter in fine condition and growth got underway early in the spring of 1947. In the first part of May the pasture, now divided into four parts to rotate grazing, was clipped to control annual weeds. In late June the pasture was mowed for hay, yielding an average of 1.8 tons per acre.

Then the district needed cattle to keep the growth down. Fred Hansen, one of the valley's leading cattle raisers, brought in 50

range yearling steers and put them on the pasture. The grass and clovers averaged 12 inches high when the cattle were turned in one of the four pastures. From then 'till fall, the cattle were rotated so that they were in a new pasture about every 10 days. In other words, each quarter of the pastures had 30 days of unmolested growth between each grazing. This gave the irrigator an opportunity to irrigate each field twice between each time the cattle were in the field.

In line with the experts' recommendations, the fields were understocked purposely for the first year grazing. When Hansen took off his Hereford cattle on October 17, they had gained an average of 171 lb. The pasture in 85 days had made 209 lb. of beef per acre.

Now the pasture was in good shape for its surprising production in 1948. All the fields were well seeded and thrifty, but the lower field, the one which had been partly a cattail swamp, didn't show as much clover as the others.

Pasturing in 1948 began on April 23, when 60 head of yearling steers were turned on the pasture. They were high grade white face cattle.

About this time the good farmers of the valley, who had been skeptical of the outcome of the venture, began to talk. Here was early lush growth of clovers and grasses while the native pastures hadn't begun to show much in the way of growth. The best of the native pastures in the valley was not ready for grazing until 12 or 15 days later.

But the 60 steers weren't keeping up with the growth. So additional steers were brought in until there were 100 head. And still the four fields kept on booming. At one time in mid-summer it looked to many farmers, who were by now driving past the pasture every few days, as if the growth was getting ahead of the cattle.

Grazing was rotated and fields were irrigated in 1948 much the same as in 1947. The fields were clipped twice to control weeds. There was one variation between 1947 and 1948. We wanted to see for ourselves and demonstrate for others the effect of superphosphate fertilizer. So we put it on only half of each of the four fields in 1947. The fertilized portions were grazed down more than the unfertilized halves. The fertilized parts also showed quicker recovery and better color than the others. To mark the end of 1948 grazing season, the district and the Kittitas County Cattlemen's Assn. asked in cattlemen to watch the weighing out ceremonies. When things were all totaled up, the 41 acres had made 26,560 lb. of beef in 1948. This

figured out an average of 647 lb. per acre. The steers gained an average of 2.18 lb. per day for the 154 days they were on the pasture.

That is convincing enough evidence for the cattlemen. Any pasture that will make 647 lb. of beef is a whopping good one. And the cattlemen—and the dairymen who also were keeping an eye on the operations—didn't all need to wait till the roundup ceremonies.

Even before the windup of the season, several dairymen and cattlemen had said, "I want to get some pasture just like the district's."

Ten farmers in the district already have seeded down more than 300 acres to the new type pasture. Twenty others have land in various stages of preparation for seeding. By last April 1, Miller had assisted farmers work out plans for more than 3,000 acres of pasture "just like the district's."

The seed mixture we finally settled upon has been a fine one for our circumstances, with the exception of two of the grasses, English rye and tall oat. Some of the experts had recommended that we seed four lb. of English rye per acre, but we decided on one-half lb. At that the English rye came up thickly. But we have observed it furnishes little forage and requires frequent irrigations to keep it green. We estimate that its growth is only about one-tenth of that of orchard grass. The tall oat in the mixture disappeared under grazing.

We've observed that under our conditions orchard grass starts to grow earliest in the spring. Alta fescue and smooth brome comes on about 10 days later.

As for costs, Miller, who has worked closely with us from the beginning of the undertaking, has figures showing that permanent improvements averaged $37.59 per acre. This included the cost of drainage, cross-fencing, leveling, revision of the irrigation system. These improvements would be necessary to prepare this land properly for any crop.

Seed costs averaged $10.82 per acre. In addition there was the expense of summer fallowing and seeding. We, of course, used certified seed, as we recommend to farmers working with the district.

Our $6.76 cost of 100 lb. gain was broken down, as follows: management costs (fertilizer, clipping, spreading droppings) $1.98; fixed costs (taxes, water) $1.38; investment costs (5% value of land, 5% of cost of leveling and draining) $1.28; depreciation costs (based on 10-year life of pasture seeding) $1; and livestock costs (5% value of cattle and cost of salt) $1.12.

The pasture is in excellent shape after the severe 1948–49 winter. Miller feels that if the pasture is fertilized each year and taken care of the way it has been

it will be at least 10 years before the forage production will decline noticeably.

Many of the cattlemen who came to the weighing out last fall expressed a feeling that the pasture had a lot of feed left. They saw one-third of the grass and clover in the pasture had an average stubble of five or six inches. The stubble height of the rest was from two to three inches.

Miller explained that undoubtedly further gains could have been made by the cattle if left on longer. But he pointed out that any gains the cattle might have made last fall would have been "stolen" from the cattle this year. That is close pasturing late last year would mean a late start this spring and might cause some of the clovers to be winter killed.

The skeptics who like to see the plants grazed down to the roots still shook their heads, but they can't forget that perhaps the experts have something. They kept coming back to 647 lb. beef per acre!

Why Let Machines Rust Away?

Condensed from Wallaces' Farmer and Iowa Homestead

More farm machinery rusts out than wears out, according to engineers. Rust is the cause of serious damage to bearings, plow-shares, blades and other finished parts.

The old standbys—oil and axle grease—have a new ally in rust inhibitor compounds. "Results obtained show that a rust inhibitor tends to prevent rust up to several months," says V. J. Morford, professor of agricultural engineering at Iowa State College.

He suggests removing all dirt from disks, shovels, moldboards, rolling coulters and other soil contact parts. Then coat them with a rust preventing compound.

If you can't put all your machinery in a shed use plenty of rust inhibitor, and housing won't be quite so important.

Rubber-tired machines should always be stored under a roof. If you want best service from your tires, block the machine up so the weight is off the tires. Wash the tires on your sprayer with water, to get rid of chemicals that might cause damage.

Before storing, carefully clean combines, binders, ensilage cutters, pickers and other crop handling machines. Then remove all belts and chains.

Wash chains in gasoline, dry, and dip in hot oil or a rust in-

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Des Moines, Iowa, November 20, 1948

hibitor solution. Apply heavy oil to threads on bolts used for adjustments. Grease sheave faces and sprocket points.

Belts should be scraped clean of grease, washed in soapy water, then stored in a clean, dry place.

It is a good idea to paint shiny spots on the platforms or guides with rust inhibitor. You can do the same on the underside of the binder grain platform.

Motors on self-powered field machines also need preparation for storage. Drain the crankcase and fill with fresh oil. Idle the motor for 15 or 20 minutes.

Then drain the block and radiator. Draining the fuel system will prevent the fuel from gumming up small passages. Leave all drain valves open.

Then you can remove each plug and pour a couple of ounces of light oil into each cylinder. After that, turn the motor over two or three times.

Canvas should be removed from the machine, brushed as clean as possible, then rolled and stored in a dry place. If you hang it from rafters by wire, mice and rats can't get at it so easily. Cover it with building paper to protect it from birds.

As your farm machinery goes into storage, it is important to check for badly worn parts. Make a list of repairs needed. Order the parts now. Then you can make repairs this winter—be ready to go next season. Tighten loose bolts and screws as you check for repairs.

Most farms don't have enough storage space. You can take some machines apart so they take up less room. If your rafters are heavy enough, many implements like planters and cultivators can be hung from the rafters or stored above the rafters. On some larger machines, like balers, combines and pickers, a tarpaulin to provide protection against snow and rain will be a good investment.

Moisture Test

If you plan to store small grain on the farm, use this simple moisture test: Scoop a handful of the grain into a dry fruit jar, then sprinkle in some common table salt. Screw on the jar cap and shake. If the grain is too wet to keep in storage, it will quickly cause the salt to appear damp and puddly. If the salt stays dry, the grain is dry enough for storage.

—*Successful Farming*

Organic Farming

Condensed from The Organic Farmer

Dr. Ehrenfried Pfeiffer

THE aim of organic farming is to maintain or produce humus in the soil. Virgin prairie and most fertile black soils on the average contain 4 to 6% humus. The organic matter content of the cultivated soils of the United States has declined to a mere 1½% and some poorer soils, particularly those of intensive truck gardens have a content as low as ½%. These facts point to the task. Were the problem only the maintenance of organic matter the task could be solved to a large extent by a proper crop rotation with not more than 3 years of tillage (for grain and root crops) to be followed by at least 2 years in cover with grass, clover, alfalfa or hay and/or pasture. But the facts are that intensive cropping and one-sided rotations are fast consuming the last resources of the soil and that the rebuilding of a soil, restoring its fertility, requires more effort than simple mining does. Humus can only derive from decayed and transformed organic matter.

At this point we must undertake to correct a wide-spread misconception. Organic matter in soils does not always consist of "humus". Even what we call humus is not always stable, permanent humus. The ideal stuff is a stable, near to neutral—pH 6.2 to 7.0—colloidal humus. Henceforth we shall call this "stable humus". This excells all other soil ingredients in its high absorptive capacity; it will maintain moisture even under average conditions of drought; it will absorb excessive moisture. It will "hold" the soil. Through absorption of moisture it will also absorb and hold minerals available and trace elements as well and can thus be characterized as the natural storehouse of soil fertility. Plant roots and soil microlife can draw on these stores even when soluble available minerals have been used up. Stable humus is produced by soil micro-organisms (earthworms, fungi, bacteria) from raw humus and, in general, from crude organic matter. The art of farming is to attain this ideal state of humus. To destroy this ideal state has been the main endeavor of modern farming, not out of bad will, but as the consequence of ignorance.

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Emmaus, Pa., September 1949

A second type of humus is raw humus—partially broken down organic matter, undigested or insufficiently digested by the microlife in the soil. This type of humus is a frequent first result of ploughing under fresh manure, green manure crops, stubble, trash. Only if the proper conditions for the mircolife exist will this form be transformed into stable humus. Otherwise the raw humus will break down with a loss of nitrogen and carbon dioxide, and the minerals contained will be washed out. The effect of raw humus upon soil fertility is not lasting. Frequent applications are necessary. Intensive cultivation will speed up the losses and the so-called old power of manure will not last. Repeated tillage for grain crops without soil cover speeds up this process. Climatic conditions also have an influence. Heat and exposure to the sun result in speedy breakdown, especially in light soils, while cool and moist climates have a conserving effect. In Canada and the Northern States the same amount of manure may maintain its after-effect for 3 to 4 years, in the Middle States 2 to 3 years, while in a dry Southern climate the effect may last only from 6 to 12 months. These facts necessitate the use of conserving methods.

The third type of humus is acid humus (humic acids). This humus is unstable and will eventually be washed out, run off with the drainage, or be precipitated in or near the subsoil. In waterlogged soils or those rich in iron oxides or carbonates, this acid, raw humus even hinders the growth of plant roots, is impenetrable, tends to form an acid hard pan (particularly underneath old pastures). Its formation should be avoided under all circumstances.

The organic farmer aims to maintain the first type of humus. If his soil is low in organic matter he has to produce humus. The United States average content of 1.5% organic matter is too low. A content of at least 2 to 3% is desirable, 3 to 4% organic matter can easily be obtained. This humus is the storehouse for moisture, soluble minerals, trace elements, and represents food for the microlife of the soil. Fine plant hair roots thrive in it; these are the roots which absorb food for the plant. Manure, composting, green manuring crops alone do not provide enough of this humus. It is the microlife in the soil which actually produces it. An example may illustrate the situation. Ten tons of farmyard manure per acre are about the maximum a farmer can provide for a root crop, corn, potatoes, or other heavy feeders. The earthworms in a fertile soil alone produce 20 to 25 tons of humus per acre in addition to the manure. Ploughed under crops, stubble and manure provide or-

ganic matter and the soil life in turn produces humus.

It is, therefore, to the interest of the organic farmer to have as much organic matter available as possible in a form which can be easily digested by the microlife of the soil. Sources of this are composted manure and compost made from organic refuse, leaves, etc. Fresh manure does not fill this requirement as well as does composted manure. Then too, in the case of fresh manure, important elements such as potassium and nitrogen may be washed out or lost in other ways. The organic farming method, therefore, suggests the use of treated manure. By many practical farmers the double handling of manure is opposed as time consuming labor. The increase in fertilizer value, particularly of nitrogen, the easier handling of a decomposed manure in spreading and ploughing, the ease of handling a crumbly, humus soil, all balance out the extra labor involved in handling the manure.

A second important item of organic farming is that of proper crop rotations. Humus will not only be produced but it should be maintained. Certain crops consume more humus than others. Legumes, in general, produce the humus condition, so do grasses for hay or pasture. Corn produces less humus, grains even less. In fact a grain-grain rotation is humus consuming. It is important, therefore, to alternate humus consuming, tilled crops with humus conserving crops.

A rotation consisting of corn-wheat, corn-wheat is definitely detrimental to the maintenance of humus. On the other hand, a rotation of corn-wheat-oats plus a seeding of grasses and clovers (the grass and clover kept for at least two years as hay or pasture) just maintains the organic level in good soils. On poor soils two years of tillage and two to four years of grass and clover cover may be necessary, while a good soil may stand up under three to four years of tillage in succession. Once a high organic matter level has been reached one can easily risk longer periods of open tillage.

Climatic conditions are also influential factors in this problem. The intensive heat and sun radiation in southern climates break down organic matter much more quickly than the cool and moist conditions of the north. Since the manure supply of the farmer is limited by the available amount of livestock a more humus conserving crop rotation is indicated the farther south one goes. The organic deficiencies can be compensated for by cover crops, green manuring, and by longer rotations. In general the same crop should not be returned to the same field sooner than four years.

Another factor is the varied be-

haviour of soils. Light, sandy soils form humus easily but do not hold it long unless humus maintaining practices are continuously applied. Heavy, loam soils react very slowly, particularly if not well aerated, but hold humus longer. Here the maintenance of a crumbly, physical structure is important not only for the crop itself, but even more for the process of humus formation. A waterlogged soil may even increase an "organic matter" but it will be raw, acid and of little value.

Always remember that nature did produce fertile, humus soils without manure or fertilizer, but also without constant cropping, that is, with cover crops, mulching from leaf fall, and grasses returning to the soil. The nice black (not to be confused with peat soils) and black-brown, neutral soils originate when there is an equilibrium between absorption and evaporation of moisture, aeration and cover. The more nearly our methods of cultivation approach this state of balance the more humus will come into existence by means of natural processes.

One of the first requirements is to produce as much farmyard manure as possible. The more livestock one has the better it is. Use shredded litter; it is easier to handle and it rots more easily than long straw. We blow the straw into the mow with the ensilage cutter. We also collect straw after combining by raking it into windrows and piling it up in order to have enough litter. From a stanchion type barn with a gutter, the manure is brought out to the field every day, but not spread. It is stored in a long pile alongside the very field where it will be used when it is rotted. Plough a bed the proposed width and length of the pile, move the earth to the sides of the bed with a scraper, snow blade or manure loader. Dump the manure on this bed. Recently, a few good spreaders have appeared on the market which also permit the dumping of the manure in a heap without "spreading". These are ideal for the building of piles. If the manure is very wet and soggy make the piles narrower, if it is loose and dry make wider piles and trample them down; make these piles rather high, around 5 feet, while the wet stuff should be allowed to steam out for a few days and be piled lower, 3 to 4 feet. In other words, do not pile the next layer on immediately, but wait a few days, meanwhile piling in the length of the bed.

We space our piles along the field so that one can begin with the spreader at one heap, and when the spreader is empty it has arrived at the next pile. One fills up there again and ends up when empty at the first pile once more. The time which can be saved in this way by avoiding long, idle

runs with the spreader considerably counterbalances the time used in piling, especially since at the time of spreading one is usually in a hurry. If a heap must be stored over a long period of time it is best to cover it with a thin layer of earth, straw, leaves, or even dry weeds.

Loafing barns lend themselves to the treatment of manure. Use shredded litter and plenty of it so that all moisture is absorbed. From time to time broadcast over the whole surface a few shovels full of good, dry topsoil, like a dusting of sugar on a cake. Except for the last, or top layer, this manure will be ready for use once the time has come for cleaning.

We figure on 8 to 10 tons of rotted manure per acre for the manure-requiring crops in a 4 to 5 year rotation. If the land is poor (or lies farther south) 5 to 7 additional tons are given in the third or fourth year of the rotation, usually as a topdressing in fall or early spring on the grass and clover crop. The following outline illustrates how you may arrive at your manure needs. Ten tons per acre in a 5 year crop rotation means that of five units, one receives manure each year, or ten tons per acre keeps five acres alive. Should the second, smaller dressing be necessary, the amount needed will be 15 tons per acre. A 100 acre farm with a 5 year rotation will have one crop unit of 20 acres. 200 tons of manure will be needed. With a 4 year rotation the unit will be 25 acres and 250 tons of manure will be necessary. A 3 year rotation unit would be 33 acres and 330 tons of manure would be the corresponding amount necessary. This last is not practical in many cases, except on dairy farms, and consequently we recommend longer rotations.

Under the described conditions the farm will maintain its fertility under its own stream, that is, it will be self-supporting in regard to its manure supply.When we speak of 10 tons we mean cow manure. Ten tons is the production of 1 cow (including litter) per year with a 5 to 6 month stabling period. The manure production equivalents are as follows: 1 cow = 1½ bull, steer, bred heifer, horse, or 2 yearlings, 4 to 6 calves, 6 to 10 pigs, 20 sheep (if penned), or 100 to 200 chickens. This all depends somewhat on the kind and amount of litter used and can only be used as a guide for calculating the necessary number of animals for a given acreage. These figures are derived from experience; for orientation in detail one would have to consult the soil tests, etc., in order to arrive at a final conclusion. The 100 acre farm with a 5 year rotation would need 20 cows; with a 3 year rotation 33 cows, or 20 cows, 7 heifers, 1 bull, 10 calves, 10 pigs, and 400-

600 chickens. As soon as a manure deficiency shows up one would look for other sources of organic matter, first compost from farm wastes, weeds, etc., then other organic wastes. Or one would lengthen the crop rotation and work less intensively. The above mentioned figures apply to intensive cropping.

In writing this I am fully aware, on the basis of 25 years of experience in farming under various conditions, that not all farms lend themselves easily to conversion to organic methods. A careful survey of the land is necessary, soil tests, the calculation of the proper proportion of arable to pasture land, a crop rotation must be worked out, the number of livestock needed determined, and last but not least the economic situation and financial resources of the farmer as well as an evaluation of the available labor and its quality must be considered. When all this is taken into consideration, it can be said, on the basis of our experience, that a farm can be made to pay and be self-supporting in its manure supply.

We advise anyone who wishes to convert according to the outlined principles to make a detailed plan and budget before he begins. Organic Farming is not a fad but very sound business.

Fertilizers Improve Alfalfa

Condensed from The Shorthorn World

C. O. Rost, Paul M. Burson, Freida L. Hammers
University of Minnesota

THE chemical composition of crops directly affects their quality and feeding value. The nutrients of special importance include protein and the mineral elements phosphorus, calcium, magnesium, and potassium, along with a considerable number of trace or minor elements such as manganese, zinc, iron, and copper. That the chemical composition of crops is related to the chemical composition of soils is recognized generally. Soils well supplied with organic matter and available mineral elements produce high-quality crops in so far as feeding value is concerned, while run-down and infertile soils produce less palatable and less nu-

Reprinted by permission from the Shorthorn World
Des Moines, Iowa

tritious feeds. Some farmers purchase feed from fertile areas because livestock make more rapid and profitable gains than on the same type of feed from poorer soil areas.

While legumes such as alfalfa, clovers, and soybeans differ in their chemical composition, they have a higher feeding value than non-legumes, such as timothy, millet and brome grass. This is true primarily because the legumes are higher in protein and also generally higher in minerals, especially phosphorus and lime.

Three critical nutrients in hay and forages are protein and the minerals phosphorus and calcium. Concentrates are fed primarily for their high protein content. The minerals phosphorus and calcium can be fed in mineral mixtures but are more effective when fed in high mineral forage and hay. Livestock eat such feeds more freely.

Since the intake of phosphorus by crops is closely related to amounts of this mineral available in the soil, the supply of available soil phosphorus will affect the feeding value of crops. The soils in most areas of Minnesota are known to respond markedly to applications of phosphate fertilizers, indicating that they are low in this element. This has been reflected on unfertilized land in a low phosphorus content in hays and forages and has resulted in phosphorus hunger in cattle. When cattle continuously are fed hays and forages containing less than .15 percent phosphorus (3 pounds per ton) certain abnormalities develop. These are characterized by a depraved appetite resulting in chewing of bones, poor growth, poor reproduction, weakened bones, weakness in young animals, and poor appetite for roughage.

In Minnesota alfalfa is of first importance as a hay crop. It is well adapted to the climate and generally to the soils. It usually is ranked as the best of the legumes because of its relatively high content of protein and minerals. It is well adapted for seeding in mixtures with other legumes and grasses and so is highly important in soil fertility systems.

In 1942 the Agricultural Experiment Station began collecting samples of hay from each cutting on fields of alfalfa and analyzed these samples, for protein, phosphorus, and calcium. This study was continued until the end of 1945. During the four-year period 69 fields located in five soil associations in the western half Minnesota and extending from the Iowa line to the Canadian border were sampled and analyzed. From each field, hay samples were collected from unfertilized and superphosphate-treated areas.

Fertilization with high-analysis

phosphate definitely tended to increase the protein content of alfalfa hay. In only one year, 1942, was there no increase in the percentage of protein. The four-year average increase for the phosphate-treated land on the 69 fields was 0.75 percent. While this increase in percentage is not large, it is of considerable importance when considered in connection with the increase in yield obtained on fertilized land. For the 69 fields analyzed, the average yields were 2.13 tons an acre for the untreated and 3.14 tons for the phosphate-fertilized land. This was an increase in favor of phosphate of 1.01 tons an acre. A calculation of the yield of protein shows that on the average an acre of untreated land produced 828 pounds and a phosphated acre 1,268 pounds of protein. If there had been no increase in the percentage of protein a yield of 3.14 tons would have carried 1,221 pounds of protein or 47 pounds less than the 1,268 pounds which it actually contained. The 47 pounds increase an acre is approximately equal to 150 pounds of 30 percent protein feed. Thus for every 13 acres of fertilized alfalfa the protein increase about equals 1 ton of 30 percent protein feed.

At the beginning of the phosphate-fertilization study, all operators of the farms reported symptoms of phosphorus hunger in cattle, and all were feeding mineral feeds. As their fields were fertilized with superphosphate they reported a disappearance of phosphate - deficiency symptoms and a progressive decrease in mineral feed eaten by cattle. Since the use of superphosphate definitely increased the yields of alfalfa hay it might be expected that it would also increase the phosphorus content. While this is not always so, it was found to be true in the great majority of the hays analyzed in this study. The amount in the phosphated alfalfa averaged slightly over 20 percent higher than alfalfa from unphosphated land.

The lowest average percentage found in hay from untreated land was 0.21 in 1944. This was the only year in which phosphate did not substantially increase the phosphorus content of the hay. During the course of the study a number of individual samples from unfertilized land containing only 0.18 percent phosphorus (3.6 pounds a ton) were found. This percentage is near the 0.15 percent critical amount.

The higher percentage of phosphorus in hays and forages is of extreme importance. It contributes to the improvement of livestock health, it increases the feeding value, it increases the palatability of the feed, as shown by livestock preference for phosphated hay and pasture, and it

reduces or eliminates the need for mineral supplements.

Fertilization with high-analysis phosphate did not appreciably increase the calcium in the hays analyzed in the study. The fields on which the alfalfa was grown are well supplied relatively with lime so that difference in calcium content would not be expected. The average calcium content for the untreated and phosphated portions of the 69 fields was almost exactly the same—1.63 and 1.64 percent, respectively. High calcium hay is to be preferred and should be worth more a ton than that produced on soils deficient in lime.

The question may be asked as to what the increases in yield of alfalfa from the use of phosphate has meant in terms of the increase in tonnage of high-quality hay on the farms on which the 69 fields were located.

On the average 28 tons of alfalfa hay yearly were produced for each farm more than would have been the case if no phosphate had been used. This additional hay carried approximately 11,300 pounds of protein and was equivalent to the amount of protein carried by 15.3 tons of linseed oilmeal. The phosphorus in the hay averaged 157.7 pounds a year and was equivalent to the amount of the constituent carried by 1,577 pounds bone meal. The additional 28 tons of alfalfa which contained approximately 28,800 pounds of total digestible nutrients permitted an increase in the number of cattle kept or better feeding practices or both. This increase in protein and phosphorus was obtained for the cost of the superphosphate which was only a small part of their cost in the form of feeds.

Most of the operators of the farms were using five- or six-year crop rotations in which the alfalfa was cut for hay during two or three seasons. An application of 300 or 400 pounds of 0-20-0 or 150 or 200 pounds of 0-47-0 was made once in the rotation and was applied for the grain crop with which the alfalfa was sown. No more fertilizer was added until the land was again seeded to a legume or legume-grass mixture. The fertilizer applied also produced substantial increases in the yields of the small-grain companion crop and the intertilled crops which followed the hay.

There's A Right Time to Harvest Trees

Condensed from the Ohio Farmer

M. L. Mullay

FARMERS are losing many thousands of dollars of cash income every year by failing to "harvest" their woodland timber at its valuable prime. Take the white ash, for example, of which Louis Bromfield has recently marketed 12,000 board feet from the 140 acres of timber on his Malabar Farm near Mansfield. White ash is one of the most valuable and useful hardwoods to the farmer—valuable because it is in steady demand at good prices and useful because it is by far the best wood for handles in forks, shovels, hoes, rakes and similar farm tools. No other wood has the right combination of bending strength with light weight, toughness and ability to wear smooth. Hickory, though tough, is too heavy and takes a permanent "set"; other woods are too rigid or lack strength.

Most of the white ash trees cut at Malabar measured 16 inches or more DBH (diameter breast high). Smaller trees were removed only where they were defective or interfering with the growth of others. In ten years Bromfield expects to harvest another white ash crop. And of course, this is only one species of trees in the woods. In contrast, thousands of other farmers are either cutting young trees which would greatly increase in value if held, or making the costly mistake of letting mature trees grow big-topped and brash while they overshadow and retard the growth of all surrounding timber.

Here is the simple arithmetic which explains why properly timed cutting is the only sound conservation practice. An ash tree, growing in an old woods, may well grow slowly, possibly taking 50 years or more to reach a breast-high diameter of 11 or 12 inches. If by then it has reached high enough to get some sunlight on its crown, it begins a period of much faster growth. This can be helped along by cutting some of its larger neighbors which are ready for harvest.

In this new period of, say, 20 to 30 years, an 11-inch tree that contained only about 24 board feet of usable timber can grow into a taller tree of 18 to 20 inches diameter. Such an 18-inch tree will provide 200 board feet. A good 20-inch tree is likely to contain 275 board feet, because each inch of growth in diameter is accompanied by an increase in usable length in the trunk. Average these

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Cleveland, Ohio

figures and you will find that the same tree is producing board feet of salable lumber 20 times faster during its middle growth period than it did in its youth. And this rate of growth continues until the tree reaches an optimum size, not over 20 to 22 inches as a rule. Moreover, during this vigorous period the white ash produces its toughest wood, the ideal material for handles in your hay, grain and manure forks.

But, once a tree has reached its prime, postponement of cutting can only cost its owner money. Instead of making good, tough wood, the vigor of the tree dwindles and goes into broadly spreading top. Slowing down of trunk growth produces brash or brittle wood. It may look like good wood but it breaks too readily. The undesirable brown heart wood begins to develop faster than new wood is added to the outer trunk. Worst of all, the oversize tree, with its wide-spreading top and greedy roots, deprives younger trees of the sunlight, moisture and strength with which they could be making rapid growth in size and market value. One tree that, in an old woods, took a long time to grow to 11 inches might have been a 14- or 16-inch tree, had the woods been properly cut.

So it is not only good business to harvest your white ash trees before their old age, it is also good conservation. You will get a good price for your mature trees now and leave a second crop of vigorously growing trees instead of a few hoary giants whose wood is certain to be poor.

Manufacturers of farm and garden tools, who depend on a steady supply of white ash handles, are as interested as you are in selective cutting which will insure a continuing supply. They stand ready to buy the trees which should be cut. Your timber dealer can estimate your woods with you and point out the trees that are ready for market and also those that should be cut for the benefit of more valuable trees near by.

Conservationists add another forceful plea: Keep your stock out of the woods if you value your timber for itself and for its water-storage function on your farm. Pasturing, foresters point out, slows tree growth, eliminates young replacement trees, and will eventually destroy the woods completely. The moist, spongy forest floor that protects tree roots and nurtures seedlings becomes packed down under the hoofs of browsing herds, exposing roots and destroying its water-absorbing capacity. Such a woods is no better than a field for conserving moisture. Let nature's trash lie. A brushy woods provides shelter for valuable wildlife, feeds farm springs and grows fine crops of timber.

Fence In Your Farm Profits

Condensed from The Western Farm Life

Robert Rowe

RAIL and stone fences belong to the era in which hard work was considered good for your character, regardless of whether it made you any money. Farm fencing long since has moved out of the stone age into the iron age.

Steel, both for wire and posts, makes easily installed fences that are durable and have a low yearly cost. The popularity of wire fences has resulted from the invention of machines which make barbed and woven wire at low cost. In 1874, factories turned out only 5 tons of barbed wire. Today, a single plant, the Colorado Fuel and Iron Corporation mill at Pueblo, Colorado, can produce approximately 2000 tons a month.

Before manufacturing methods were perfected, barbed wire weighed approximately 1000 pounds per mile. Modern wire weighs only 400 pounds per mile because zinc coating methods have been improved to the point where it is not necessary to make wire heavy to give it long life. The early, heavy wire was so expensive that cost of fencing was almost prohibitive. Cost often exceeded the value of the land and all the cattle that would graze on it.

A good fence is insurance against lawsuits, avoids the annoyance of wandering livestock and gives a farm a trim appearance. Barbed wire and woven wire are now the two most popular types of farm fencing, although boards, rails and stones are still used in some areas for special purposes. Stone and rail fences are difficult to construct and occupy a wasteful amount of land. Of course, they are adaptable only to areas where stones or timber are available.

The first woven wire was made on the fence. The line wires were stretched on posts and properly spaced, and the stays woven in by hand with an apparatus that revolved a spool of wire around these line wires.

Woven wire now is made on machines somewhat similar to rug looms. Wires, led from spools on one side of the machine, are twisted together by its steel fingers and woven-wire fencing comes out on the other side. Some machines that make poultry netting

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use wire from more than 300 spools at once.

Modern woven wire is manufactured with tension curves in the line wires. When the fence is erected, the wire should be stretched until these tension curves are about half way straightened out. More fences are understretched than overstretched. If the fence is erected with the proper tension, it will remain tight during the expansion and contraction which result from temperature changes.

Perhaps the newest principle in fencing is the use of electrically charged wire. Electrical shocking mechanisms which make it possible to fence live stock with one or two strands of barbed wire have been in use for about 30 years. This type of fencing is much cheaper than the more conventional forms because so little wire is needed. It is especially advantageous for temporary fences used around rotation pastures or to pasture crop land after harvest. Chief disadvantages of electric fencing are that livestock require initial training before they learn to respect charged wires, the current may fail and allow the stock to get out, and the wire may lose its effective charge through being grounded by weeds or other vegetation.

Temporary fences that are not charged can be quickly built with the use of steel posts. Woven wire can be used if hogs are to be fenced, while three strands of barbed wire usually will hold all other livestock on a temporary pasture. This type of fence can easily be removed or relocated as required.

New, easy and inexpensive preservative treatments for wood posts greatly increase their life and largely eliminate the necessity for replacing rotted posts during the life of the fence wire. Maintenance cost of fence will be high unless the posts last as long as the wire. The preservative method of increasing post life is highly profitable.

Posts usually are set 2½ feet in the ground and extend about 6 inches above the top wire. The over-all length, depending on the height of the fence, is generally 7, 7½ or 8 feet for line posts, while gateposts and brace posts must be sufficiently longer to meet their special requirements.

An important point in erecting durable fences is to avoid stretching wire around corners. If the fence makes a turn at an angle of more than 45 degrees, the wire should be cut and tied to the corner post. Then the free end can be tied around the post also before stretching the fence in the new direction. Also avoid driving staples into posts too deeply. They should be driven in solidly, but not buried in the post or the wire will be bent, weakening it and

breaking the zinc coating so that corrosion can start.

Lightning protection should be considered in erecting a wire fence. Much livestock is killed by lightning carried along the wire. For this reason, a fence should be grounded at least every 40 rods. Of course, if steel posts are used, the fence is automatically grounded. A fence on wood posts can be grounded by using an occasional steed post. Perhaps a more effective and economical way is by the use of wire fence stays.

Fence stays are made of heavy galvanized wire. Each stay consists of a double, twisted wire, the twist being loose enough to permit the entrance of barbed wire between the strands. The stay is straddled over the top fence wire, twisted down until it straddles over each succeeding wire and penetrates the ground by the time the upper end of the loop comes down against the top of the fence. A stay can be used between each pair of wood posts, permitting them to be set farther apart and reducing the number of posts needed by about 20 percent.

The stays prevent sagging wires and make fences stronger and more stock-tight. Each stay grounds the fence. Should lightning strike the fence or a high-tension wire fall on it, the charge cannot run more than 20 feet before it is carried to the ground.

Gates and entrances require adaptation to modern high-speed vehicles. Square turns could be made with horse-drawn implements, but automobiles and tractors, particularly when pulling trailers or implements, require entrances with curving roadways. Setting the gate back about 20 feet from the fence line adds to the safety of the entrance to field or pasture. This type of construction permits pulling implements off the highway out of traffic before stopping to open the gate.

Gates that are used often should be light, but they must be strong enough not to be easily damaged by livestock. Good types of gates include those made of boards with steel braces, woven wire supported by a tubular steel frame, and a new kind constructed entirely of aluminum. These aluminum gates are built of wide slats and give the general appearance of a wooden gate, with the advantage of the lightness, durability and beauty of this metal.

Good fences are a mark of the good farmer, much the same as high crop yields, quality livestock and weed control. These things go together on well-managed farms, increasing income and yielding dividends of satisfaction to the owners. Successful farmers agree that many little income leaks can be stopped by fencing in farm profits.

Pick-Pocket Pests

Condensed from Farm Journal

By Dr. D. W. Baker

College of Veterinary Science at Cornell University
as told to William Ward

ONE kind of mite picks farmers' pockets to the tune of 10 million dollars a year. Add him and his relatives to the flies, fleas, lice, and ticks that prey on your livestock and poultry, and you can chalk up loss figures that are really appalling.

These so-called external parasites can even make *you* uncomfortable. But you can knock them out if you know the following facts about them.

The Mange Mite can kill. Cattle and hogs infested with these tiny mites develop rough, wrinkled, scabby skin, lose hair and weight, and sometimes die. Mange always lowers milk production.

When the animals persistently scratch and rub themselves on stanchions, you should suspect mange. A veterinarian can give you positive proof by examining deep skin scrapings with a microscope. Actually, mange and mastitis can be partners. Infested with mange mites, restless cows step on teats, indirectly causing mastitis.

Mange is more severe during the winter, when cattle and hogs are confined, and appears to die out when they are turned out on pasture in the spring. If your herd had mange mites last winter, but was not treated, the mites likely will reappear this winter. *You* can get mange too, if you aren't careful, while handling mangy livestock.

While the mange mite lives *in* the skin, the scab mite lives on top. Mange is more difficult to control than scab, which clears up more quickly after treatment.

What to do. Spray with two treatments of benzene hexachloride. This gets both kinds of mites.

Cattle Lice. Two cattle lice—the little red louse and the long-nosed or blue louse—cut milk production and retard gains in dairy and beef cattle.

We often pay too little attention to young stock, and louse infestations become severe before we notice them. Then the calves get stunted, and, if feed is short on the range, may die. Even if heifers heavily infested with lice

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get a sufficient and balanced ration, they grow very slowly. Older animals lose flesh and become generally unthrifty.

That little red louse bites. Even a moderate infestation in your cattle loosens the hair so it can be pulled out in handfuls.

The long-nosed or blue louse sucks blood. This also loosens the hair, but less severely.

Lousy animals will rub on the stanchions or barn, and lick and bite infested areas. Raw, red patches appear on the skin, and an animal often draws blood in its frantic efforts to relieve the irritation.

What to do. Dusting is the best control method for cattle lice under northern conditions. Two years of tests in New York by Dr. J. G. Matthysse have shown that dusts containing 10% or more of derris or cube (half of 1% or more of rotenone) will control all species of cattle lice.

At least 3 ounces of the dust should be applied to each heifer or cow. A knapsack-type puff duster with a broad, flat nozzle does the best job for the least amount of money.

In warmer climates, dipping is generally recommended. Don't rely on cattle-fly sprays to control these lice.

Hog lice also cut profits. Two of the simplest remedies are crude petroleum in dipping vats, and a kerosene-oil emulsion applied by hand.

Poultry lice of several different kinds (biting and chewing) reduce egg production. Dust with sodium fluoride in the fall.

Rocky Mountain Spotted Fever Tick is particularly dangerous. It is a carrier of the fever which names it, as well as tularemia and Colorado tick fever. The adult tick sucks blood on cattle, horses, and humans. The larvae and nymphs feed on many small animals, especially dogs and rodents.

What to do. Use derris dip or dust treatment on animals. If you find any ticks on yourself, put a piece of turpentine-saturated cotton on them.

Sheep Tick is actually no tick at all, but a wingless fly that lives on the blood of sheep and goats. Sheep ticks multiply and spread quickly during the winter when the flock is in restricted quarters. Heavily infested ewes approach lambing time in poor condition, and lambs may lack normal vitality.

At shearing time, ticks migrate from ewes to lambs, because they like to live in the longer wool of the lambs. At this season, ticks sometimes kill lambs. Infected lambs gain weight slowly, and they bite and scratch the skin until the wool is damaged.

What to do. One dipping in a rotenone mixture containing a wetting agent will keep a flock

largely tick-free for a year. DDT dips also are effective, but more expensive. Power-dusting with rotenone and pyrrophylite gives good commercial control of ticks on feeder-lambs for a period of several months. The dust works better if you add a small amount of light motor oil.

Winter Tick. This colorful parasite causes unthriftiness and anemia in cattle during the winter by sucking the blood. Heavy infestations may result in death from "tick poverty." One New York farmer reported that he lost 107 head out of a total of 150.

What to do. Spray with benzene hexachloride.

Heel Fly. This pest lays eggs on the hair of cattle. Then the maggot bores into the skin, and several months later, when they are almost full grown, you can feel the grubs in bumps on the back of your cows. They ruin meat and hides.

What to do. After the grubs puncture little holes in these bumps, power spray with rotenone, or put on a rotenone dust by hand. Treat twice in the spring about a month apart. It's important to try to get area or community action.

Horse Botfly. Much of the damage caused by bots in the mouth and digestive tract of horses generally isn't recognized by farmers, but it adds up to high figures. The nose bots not only annoy and excite horses, but get into their mouths, then travel to the stomach. There large numbers of the botfly larvae interfere with digestion, cause colic.

What to do. A piece of burlap or belting attached to the bit rings is a good protector. Carbon bisulfide is a standard treatment given in gelatin capsules or by stomach tube by veterinarians in December or January.

Fleas can be mighty annoying, both to people and to your animals. Not only that, but their attacks may kill young chickens and hurt egg production. Dog and cat fleas carry disease germs, and transmit the dog tapeworm to animals.

What to do. Clean up and treat infested places with a light DDT dust. Also use a light DDT dust about once a month on dogs; a rotenone dust on cats.

For the proper concentration for any of the sprays mentioned in this article see directions on the package.

Vitamin B-12 Cuts Poultry Feed Costs

Condensed from The Farmer

CHICKS fed a ration of corn and soybean oilmeal supplemented with minerals and Vitamin B-12 in an experiment at University Farm, St. Paul, weighed a pound when six weeks old, while those that didn't get B-12 weighed only one-half pound. The experiment was conducted by Dr. George M. Briggs, associate poultry professor.

Work with B-12, which has been going on throughout the country during the past year, may result in saving every poultryman $4 or $5 a ton on feed and may give poultrymen of the United States $200 million a year more profit.

Poultrymen and nutritionists have long known that chicks need animal protein to grow to market size at low feed cost and that hens need it to produce eggs of high hatchability. They knew that meat scraps, fish meal and fish oils contained this growth booster but were relatively costly.

Early in 1948 scientists announced that B-12 had been isolated from pork liver and had been used successfully in poultry rations as a substitute for animal proteins. At about the same time that B-12 was isolated, researchers announced that an inexpensive crude material, APF (animal protein factor) had been isolated. The APF is about the same thing as B-12, Dr. Briggs believes.

Dr. Briggs pointed out that the remarkable results don't mean that B-12 is better than other animal proteins. Meat scraps and fish meal, added in the correct amounts, give equal results. "But," he added, "the B-12 in the APF concentrate has the advantage of being cheaper than the often-scarce animal proteins."

The amount of pure B-12 used by Dr. Briggs in 100 pounds of feed was so small it could be put on the head of a pin. He says one ounce of pure B-12 is enough for 73 carloads of feed when added at the rate used in his experiments. One or two pounds of the crude APF concentrate is enough to supply all the animal protein needed for a ton of rations.

Dr. H. R. Bird, poultry nutritionist at the U. S. Department of Agriculture experimental farm at Beltsville, Md., figures that B-12 may add millions of pounds of poultry to the annual production with no added production cost.

This material is not yet available in a form which makes it practical for home mixing. Some has been used in commercially mixed feeds since early summer.

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Alcohol From Farm Products

Condensed from Marketing Activities

E. O. Umsted

On two recent trips of nearly 1,000 miles each, a USDA test truck ran successfully on relatively inexpensive low-octane gasoline fortified by periodic injections of alcohol and water. Results of these tests indicate that use of alcohol in motor vehicles is potentially a vast new market for surplus grains.

The USDA researchers report that on the first trial the truck operated as well on 58-octane gasoline plus alcohol-water injection as it would have on regular gasoline, which has an octane rating of 74 or better. The alcohol-water mixture (85 percent alcohol, 15 percent water) was injected automatically into the truck carburetor when the engine was under heavy load, as when it was climbing hills, accelerating in traffic, or passing other vehicles. The engine gave knock-free performance even with the low-octane gasoline.

For the second trial run, the engine of the truck was equipped with a high-compression head (8.25-to-1 compression ratio). This made it necessary to supply the engine with fuel having an effective octane rating of at least 85. On this trip, 74-octane gasoline plus alcohol-water injection was used satisfactorily.

Because of the tremendous consumption of motor fuels—more than 80 million gallons a day—general adoption of alcohol-water injection could open up a wide new outlet for surplus grains and other agricultural commodities. Alcohol can be made from a variety of these products. The usual method is by fermentation of wheat, corn, and other crops. USDA scientists in charge of the injection experiments are working to lower the cost of alcohol and also to increase the value of feed byproducts produced by this process. They are also developing methods for converting corncobs and other farm residues to alcohol.

The researchers point out the potential importance of alcohol-water injection in extending the country's supplies of petroleum. Alcohol is equivalent to 100-octane fuel, and it can be used to increase the effective octane rating—or anti-knock quality—of gasoline. Its use makes possible a wider utilization of low-octane

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fuels, which are cheaper and can be produced from petroleum in greater quantity than high-octane gasoline.

The road tests were conducted by USDA's Bureau of Agricultural and Industrial Chemistry, and financed under the Research and Marketing Act of 1946.

The truck used in the tests was a standard model fitted with a small tank under the hood to hold the alcohol-water mixture. A simple device injects the mixture, as needed, automatically into the carburetor. Injection is controlled by engine-manifold vacuum, which accurately reflects the engine load.

Fuel consumption for the first 938-mile trip was 106.7 gallons of 58-octane gasoline, plus 8.85 gallons of the alcohol-water mixture. The truck averaged 8.8 miles to the gallon of gasoline—about normal for this type of vehicle, which weighed 10,300 pounds when loaded for the trip. As these figures indicate, 1 gallon of the mixture was used for every 106 miles of driving. The experimenters report that the mixture was being injected about 20 percent of the time the truck was on the road, and that during this time the mixture amounted to about 30 percent of the fuel consumed. Because the alcohol served both as fuel and to increase the anti-knock quality of the gasoline, there was a saving in gasoline consumption estimated at about 6 percent.

But the real fuel saving is shown by the fact that every gallon of alcohol and water used permitted the engine to burn 12 gallons of low-grade gasoline (58 octane) in place of 12 or more gallons of ordinary gasoline (74 octane). In producing gasoline from petroleum, the yield decreases about 1 percent for every increase of 1 octane number in the refined gasoline. On this basis, use of 58-octane fuel rather than fuel rated at 74 octane represents a saving of about 16 percent in terms of crude petroleum.

On the second trip, with a high-compression head on the engine, it was found that each gallon of the mixture allowed the use of 21 gallons of 74-octane fuel in place of the 23 gallons of 85-octane fuel that would have been required if the mixture had not been used.

During at least 80 per cent of normal driving—when a car is running on the level and up to about 40 miles per hour—the engine will operate satisfactorily on gasoline of 50 octane number or even lower. Since ordinary gasoline is 74 octane or better, much of its anti-knock quality is in effect wasted. But when the engine is working hard, a relatively high-octane fuel is required. Alcohol-water injection can provide the necessary anti-knock quality when needed. It will increase the effec-

tive octane number of gasolines by as much as 20 octane units in many instances. In other words, alcohol-water injection can be used in present-day cars with straight-run or low-octane gasoline to give the performance of regular or premium-grade gasoline, and it can be used with regular gasoline to give super-premium gasoline performance. This is particularly important in view of the current trend toward high-compression engines, which require super-octane fuels. With alcohol-water injection, the octane requirements of these engines can be satisfied with the ordinary automobile gasolines available today.

Orchardist Sells Air and Water

Condensed from Better Fruit

Dr. R. E. Stephenson
Soil Scientist, Oregon State College

TREE fruits and berries in the fresh state average about 86 per cent water and 14 per cent dry matter, largely starch, cellulose, and sugars. The woody material of the plant contains in addition a considerable portion of lignin.

Considering the dry matter of the plant, the elements carbon, hydrogen, and oxygen coming from air and water comprise 90 to 95 per cent of the tissue including the roots, branches, trunk, leaves, and fruit. Carbon alone coming from carbon dioxide of the air accounts for 40 to 50 per cent of the dry matter.

Estimating the total dry matter for the season in all the growth, including the fruit on an acre, at six tons, about 5,000 pounds of carbon would be needed. This would require approximately 18,000 pounds of carbon dioxide.

In the air over an acre at any one time is only about 44,000 pounds of carbon dioxide, so that nearly half the amount would be required for one season's growth and fruit production.

Fortunately, however, carbon dioxide in the air is renewed about as fast as it is used up so that the total amount present in the air remains about constant.

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The renewal comes from the rotting organic matter of the soil, and from the roots of plants which evolve carbon dioxide.

One of the benefits from adequate humus renewal, therefore, comes from the increased evolution of carbon dioxide which supplies the leaves with this important raw material for plant growth.

Likewise, it is important to have good foliage to utilize the carbon dioxide as it is made available to the plant. Larger leaves and more chlorophyl enable them to utilize sunlight more efficiently to manufacture food for growth.

Green leaves have the power to manufacture carbohydrate, utilizing sunlight as the source of energy, and carbon dioxide and water as the raw materials.

The amount of food manufactured by a vigorous plant is larger than the casual observer may realize. It has been estimated that 80 per cent of the carbohydrate manufactured by the plant is destroyed by oxidation during growth to provide the energy for the vital processes of living plants.

There are, therefore, five times as much manufactured by the foliage as appears in the growth and storage by the plant. All this emphasizes the importance of good foliage, adequate moisture, a favorable temperature, light exposure, a vigorous functioning root system, adequate nutrients from the soil, and generally favorable conditions for the plant.

But in recognizing the large portion of the plant which comes from air and water, the contributions from the soil cannot be overlooked. The large amount of water which must pass through the plant comes through the soil. The physical properties of the soil, therefore, must be favorable to the development and functioning of a root system, so moisture can be used.

Physically and on a volume basis, good soil should approximate 40 per cent mineral particles, 10 per cent organic matter, 25 per cent moisture (when at the field capacity) and 25 per cent air space of large pores too large to hold water. This large pore space contains only air and the root systems of the growing plants but it is just as important to the welfare of the crop as the solid particles of earth or moisture in capillary pores.

Roots must have oxygen if they are to live and the plant is to thrive and produce a satisfactory harvest.

The importance of a large volume of functioning roots may be better appreciated when it is realized that these living roots must extract from a moist soil from 200 to 1,000 tons of water for each ton of dry material in plant growth. This water must pass from a thin moisture film on the

grains of soil, or from the fine capillaries, through the root hairs and up through the stem and branches to be mostly evaporated from the leaves.

Only a relatively small portion remains in the plant as part of the tissue or as a circulating medium in the sap for transporting nutrients and manufactured foods in the plant.

Good soil is a reservoir for moisture storage with a gallon or more of crop water in each cubic foot of soil at the field moisture capacity. The soil also furnishes the necessary contact between moisture and the living plant root. The moist colloidal humus and clay of the soil, and the moist colloidal pectin jel of the root system are so intimately related that they form a continuous system.

When the living root is pulled away from the soil, leaving behind many root hairs and small roots that are responsible for the intimate relationship between the root and the soil, the plant has difficulty in surviving as a transplant, unless great care is exercised in replanting and furnishing the needed moisture.

Considerable time is required for the transplant to grow new roots and to re-establish the close relationship between the roots and the soil.

Plant roots must obtain not only air and water, but also a portion of essential minerals from the soil for good growth. The average mineral composition of the dry plant material is only about three per cent but it may vary up to 10 per cent or more. The total quantity of mineral matter in the plant is unimportant as long as there are no deficiencies for normal nutrition.

When any element is necessary for growth, that element is equally important whether a large or small amount is required. A ton of vegetative growth of average plants may not contain more than 10 grams of boron (there would then be one pound in about 45 tons of dry plant material) but this small amount is just as essential to the plant as the 30 pounds of potassium (about 1,300 times as much as the boron) that average well-nourished plants contain in a ton of the dry matter of the vegetative growth.

Vegetative growth, the new wood and the foliage, are very important to the fruit harvest.

Because so much of the fruit is made from air and water, and so little is taken from the soil, fruit production and sale do not take away much soil fertility. One thousand boxes of pears an acre, an excellent yield, are about 25 tons, and of this weight approximately 21 tons are water, leaving 4 tons of dry tissue.

The entire 25 tons of fruit would contain only about 45 pounds of nitrogen (no more than

is present in one ton of alfalfa hay), seven or eight pounds of phosphorus, about 65 pounds of potash, and a small amount of the other elements that are essential for all plant growth.

By contrast, four tons of dry matter of pears would contain one and a half tons or more of carbon which would exhaust neither the soil nor the air. The oxygen content of the dry matter of the pears would be nearly as great. The hydrogen content would be about one third of a ton—coming from water.

To sell carbon, hydrogen, and oxygen in the form of sweet, juicy fruit works no hardship upon anyone, does not exhaust any natural resource, is a source of profit, and is, therefore, good business.

Nutrients coming from the soil are mostly in the leaves of the fruit plants, and these should return to the soil to give up their fertility to contribute to the production of another crop. Three thousand pounds of leaves on an acre of orchard would contain about 60 pounds of nitrogen, a small amount of phosphorus, 30 pounds of potash, and some of all other plant nutrient elements.

It is not an unpleasant thought that when a ton of fruit is marketed, 1,700 pounds of the ton are water, and 90 to 95 per cent of the other 300 pounds is carbon, hydrogen, and oxygen, the supply of which is not a problem to the grower.

But, before he is too thrilled with that idea, he should recall that soil fertility and good management is of major importance—that the humus must be regularly renewed, that fertilizers must be used to correct all nutrition deficiencies, that erosion must be prevented by cover cropping and all soil conserving practices, that supplemental watering with irrigation may be necessary—that all these things and others are necessary to enable the leaves with the aid of sunlight to make delectable fruit from mostly air and water.

Honey As Therapeutic Agent

The Microbiology Institute of the Academy of Sciences of the U.S.S.R. is author of the statement that with slowly healing wounds, 90 per cent of the patients were improved by honey applications. Favorable effects were also noted with ulcers, chronic dysentery, jaundice, and swellings due to heart and kidney ailments.

Almost 100% Livability

Condensed from Hatchery & Feed

John Willoughby

IN THE hatchery business, chick livability is usually the key to business growth, and high hatchability the key to profits.

In a survey of Pullorum controlled hatcheries, conducted last spring by the Missouri Poultry Improvement Association, the Monett Hatchery, operated by Charles Dixon, had a livability score of 99.1 percent.

And at the same time Dixon moved his hatchability average up from a 70–72 percent level to a 78–80 percent average.

These records, of course, came only after years of effort during which Dixon worked carefully with his egg supply flockowners to develop a quality chick program. While serving farm flocks in his area and developing his quality program, he had one eye on the year-round broiler industry which was expanding so rapidly in nearby Northwest Arkansas.

He started out in 1936 with four small incubators to serve the farm laying flocks. Since then he has installed seven large incubator units and now his hatchery has a capacity of 224,000 or about 45 to 50,000 baby chicks a week.

And last year he had developed his program to the point where he was ready to expand into year-round hatching to serve the broiler industry as well as the laying flock replacements. He had good supply flocks. Then he had bought R. O. P. males from R. O. P. breeders and used them to head up his egg supply flocks These included White Rocks, New Hampshires, White Wyandottes, and for laying flocks, White Leghorns.

His program called for very close service work with his flockowners. He went out to farms to cull the flocks and get rid of poor producers early each season. And he went out to test for Pullorum disease. At one time this was done only once a year, but two years ago he stepped this up to three times a year. He recommended good poultry practices and balanced rations for the flocks.

This poultry service work is regarded as an essential part of the business with both flockowners and with chick customers. Dixon attends short courses at the poultry school at Columbia each year to keep up on the latest information in the industry. And his serv-

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Mount Morris, Illinois, March 1949

ice includes many field calls and regular assistance on poultry feed, disease, sanitation and housing problems.

An important part of this service program is that Dixon has developed year-round markets for his flockowners and chick customers.

Flockowners and farmers bring their eggs to the hatchery, where they are graded and packed for re-shipment.

Feeds and balanced rations have played an important part in building the business and in establishing the livability and high hatchability records. Dixon has always tried to recommend good feeds. In the fall of 1947 he started recommending a pelletized milk product (Kraylets) to help balance the ration fed his supply flocks. It was after this, in the spring of 1948, that he found his hatchability average had moved up. He found that eggs from flocks fed the ration containing the milk by-product had a hatchability score of as high as 80 percent compared to 72 percent for other supply flocks.

"I also found I had bigger, huskier chicks from those flocks. As the chicks came out of the incubators we could tell the difference. I had the best chicks I ever had and I also had far better livability," Dixon explains.

That better livability record was proven later in the spring in the Missouri Poultry Improvement Association survey among Pullorum controlled hatcheries in Missouri. The survey showed that out of 10,678 baby chicks sold to 100 flockowners, only 101 died in the first three weeks, the really critical period. That meant that Dixon had a livability score of 99.1 percent.

As a result of this experience, Dixon is seeing to it that his supply flocks are headed by R. O. P. males and are fed balanced rations including laying mash and the pelletized milk product.

Flockowners are well satisfied with this program, too, because they've found that it has boosted their egg production on which Dixon encourages them to keep accurate records. On fifty supply flocks on his new program last year, average egg production was increased from about 50 or 55 percent to an average of 70 to 80 percent for the period from October 1 to May 1. There was no evidence of coccidiosis among these flocks during the entire season.

Seed Production in Red Clover and Alfalfa

Condensed from American Bee Journal

Dr. C. J. Willard
Professor of Agronomy, Ohio State University

THE seriousness of the clover and alfalfa seed situation needs no elaboration. This situation has led to extensive research, notably through the seven fellowships supported in as many states by the American Seed Trade Association in cooperation with the ICIA, the Regional Legume Seed Research Laboratory of the U.S.D.A. at Columbus, Ohio, and many state projects in addition.

What have these projects found out? To a considerable extent they have underscored the amazing complexity of the problems involved. To obtain a good crop of clover or alfalfa seed is like crossing a bridge of many spans. If any one span is out, you don't cross the bridge. What are some of the spans in this bridge to good seed yields?

Good vigorous stands of the crops are needed to produce good yields. On soils where fertilizers are needed and used, they have increased seed production up to 65 per cent. So far, fertilizers applied to satisfactory hay crops have not increased seed yields, although there is a suggestion that magnesium may increase red clover seed yields.

Cultural practices in growing the crop have an important bearing on seed production. Rate of seeding, seeding with or without a companion (or nurse) crop, kinds of nurse crops; planting in rows of various widths; various methods of handling the stubble after harvesting a grain companion crop; and many other practices are being reexamined by these projects. So far, however, there is no evidence that seed production will profit significantly by any cultural practice not already extensively recommended. All tests, new and old agree that red clover should be cut in early bloom and cutting finished by full bloom for maximum seed yields. This is because a better growth for seed production is obtained when some reserve moisture is left in the soil for the second cutting, but insects, both injurious and pollinating, may also be factors. Alfalfa shows the same reaction to early cutting where drouth is a problem. Alfalfa must

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be so cut that sufficient root reserves are present for vigorous growth, if good seed yields are to be obtained.

Weeds reduce seed yield and quality. Chemical weed control is no part of these ASTA projects, but studies are being made of the possibility of chemical weed control in clover fields.

Diseases affect seed production. So far, no chemical controls of any clover and alfalfa diseases have been developed, so the disease factor may be controlled only by breeding and then growing resistant varieties. Adapted, disease-resistant varieties are an essential part of any seed production program and the cooperative studies with the U. S. D.A., headed by Dr. Hollowell for red clover, and until 1949 by Dr. Tysdal for alfalfa, have produced outstanding results. Of course, these difficulties in seed production are a major handicap in introducing new varieties of clover and alfalfa quickly. All states in the region have tested alfalfa varieties, and all those east of the Missouri River, red clover.

Insects may destroy the plants. This is especially true of red clover. The near-total failure of red clover seed in Ohio, and presumably elsewhere in the region in 1947 was due to destruction by clover root-borer. The potato leafhopper stunts the plants and prevents flowering in both alfalfa and red clover. Spittle bugs seriously reduced the yield of red clover in Ohio the past three years. Grasshoppers are a major problem. There is a definite hope now that these pests can really be stopped. Benzene hexachloride has given some good controls of clover root borer, although we cannot yet give directions for its farm use. It will also control spittle bug. DDT will control leafhoppers and many other insects. DDT may also control the sweet clover weevil, which has gone far to drive sweet clover out of Corn Belt rotations. Chlordane is becoming a standard treatment for grasshoppers. Chlorinated camphene has also given good results on grasshoppers and sweet clover weevils. Seed increases on red clover up to 150 per cent have been obtained by controlling grasshoppers; in fact some report that chlordane made the difference between yields too small to harvest and 2 to 2½ bushels of clover seed per acre.

Insects may destroy flowers and seed. Even after bloom appears, insects may prevent seed production. Lygus bugs attack the flowers of alfalfa, so that no seed is formed. The clover flower midge works in clover heads, destroying many of the flowers and young seeds. The clover seed chalcis lays eggs in young seeds of alfalfa and red clover. The larva develops inside the seed, destroying it. In

many Western states Lygus bugs have been so much the dominant unfavorable factor that when they were killed by DDT, as they readily may be, amazing increases in seed yields have resulted—in fact an important share of our big alfalfa seed yield of 1947 was due to DDT treatments. This is an interesting example of the spectacular results which can be obtained when just one unfavorable factor has been responsible for seed failures. Lygus bugs may need more than one treatment. Control of Lygus, etc., is no insurance of seed production.

Alfalfa and red clover must be insect pollinated. Here lies perhaps our major problem in seed production of these crops. Neither plant will set seed from its own pollen, so we are dependent on insect pollination. As we cultivate more of our land the wild bees are destroyed by destruction of their nesting places. So far, the honey bee is the only even slightly domesticated insect we have in this country.

Unfortunately, although honey bees pollinate both red clover and alfalfa at times and actually do a major share of what pollinating is done they are very inefficient in pollinating either crop. This is the span of our bridge to seed production which is most frequently out, and hardest to build. A great deal of intensive work is going into pollination problems—studying both wild pollinators and means of making honey bees more effective. Attempts at breeding both crops and bees for greater pollinating efficiency are among the solutions being tried. Soil fertilization did not affect pollination. Tall weeds reduced pollination, but a companion grass increased it. We have hardly scratched the surface of the pollination problem, and it is likely that lack of pollination will more and more be the major bottleneck in clover and alfalfa seed production, simply because the other problems are more nearly solved.

Wet weather at blooming time is a hazard to alfalfa and clover seed production. Failure of pollinating insects to be abroad is one probable reason for this, and physiological reasons, which need more study have also been given.

Finally, poor harvesting methods lose a considerable share of what seed is produced. I know of no research studies on this problem in the Corn Belt, though it is often mentioned as a problem. The seed crop should be handled as little as possible, and when slightly damp to prevent shattering. Proper adjustment of the combine is very important. Kentucky reported losses from poor combining of 50 to 75 per cent in two instances.

This summarizes the many factors that must be right before we get good seed yields. Regardless of

how fast we solve some of these problems in research studies, it clearly will be some time before a majority of seed growers have all these things set up at the same time so that generally good seed yields are obtained. It is not surprising that seed yields are poor—the surprise is that we get as much seed as we do. Many of these problems are well on their way to solution, and our seed yields are due to increase rather than decrease from here on, provided we can solve our pollination problems.

New Horizons For Greek Farmers

Condensed from The Brown Swiss Bulletin

John Halpin
Tech. Dir. of Artificial Insemination Program in Greece

THE dairy industry in Greece suffered severely during the German occupation as did the entire livestock industry in this country. When plans were being made for the rehabilitation of Greece following the Allied Victory, the Near East Foundation acting upon the advice of its agricultural advisors decided to inaugurate an artificial insemination program to build up the war ravaged herds and at the same time to improve the native cattle of Greece.

The native cow found in Greece has different characteristics in different areas. In the mountainous section many of the local cows are said to originate from importations during ancient times and are supposed to have been developed from the same race that produced the Brown Swiss. These cows are small with an average weight of about eight hundred pounds. They are excellent grazers and are very well adapted to meet the conditions found on the rough mountainous terrain. These cows are good producers of milk with an average yield under local conditions of about 12 pounds.

In Western Macedonia and Thrace an entirely different type of native cattle is found. These cows have longer horns, are larger, and are utilized more for draft purposes. They are poorer producers of milk than the smaller cows found in the mountainous section. The mountain cow is a dark brown, whereas the plain

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cow is a lighter brown or tan. These cattle are thought to have originated at a later date than the mountain cow but never replaced them because of their inability to thrive in the mountainous sections.

Other nondescript breeds are found in other sections of Greece. No production testing is done so it was impossible to select outstanding individuals within a race and improve the cattle by that means. Therefore it was suggested by leading authorities that Brown Swiss cattle would cross to the best advantage with the local breeds found in Greece and that Brown Swiss cows imported from the States would produce under the existing conditions better than any other imported breed. This has proven to be correct and once again the Brown Swiss cow has demonstrated her ability to adapt herself to an unfavorable environment.

The Near East Foundation received an original grant of six bulls from the Brethrens Service Committee and the Heifer Project Committee of New Windsor, Maryland, in 1945. These six bulls were used at an artificial insemination station at Athens operated by the Near East Foundation in conjunction with the Ministry of Agriculture. The first cow was bred here in August 1945 and to the first of April 1949, 16,222 first services had been credited to these bulls and three others that were obtained at a later date. Many heifers have freshened that were sired by these bulls and their production has surpassed the hopes of all concerned.

Another station was put into operation at Salonica in Northern Greece in 1946. The bulls that comprised this stud were Brown Swiss bulls imported into Greece by UNRRA. These bulls were not the quality that we wanted to use as a basis for the foundation of a breeding program that will some day affect the whole cattle population of Northern Greece. In the spring of 1948 we received a shipment of six young bulls again donated by the Heifer Project Committee. These bulls have attracted the attention of all the farmers and livestock men who have seen them, because of their type. They would be a welcome addition to most show strings and with the production records in their pedigrees they certainly should transmit production as well as type to their offspring.

The artificial insemination program operating in Greece sponsored by the Near East Foundation operates very differently from the average Artificial Breeding Cooperative in the United States. The program is being run directly by the government with the aid of the Near East Foundation. The farmers have not been asked to organize any breeding

cooperatives, but are represented by the already established general marketing cooperatives. The bulls are kept at government-owned stations. The breeding fees collected from the farmers are only the equivalent of one dollar in the Athens area and fifty cents at Salonica. The resulting deficit in the operational costs of the program therefore have to be made up from government funds which are now obtained through the ECA program. It is hoped that in the future the breeding fees can be increased to cover the cost of the field program, but as the economic position of the small farmer is very precarious this will be impossible until his income is increased from the present figure of less than four hundred dollars per year.

The main problem involved is markets for his products. There are very few organized milk marketing cooperatives outside of the capital city of Athens. Most of the milk produced in the villages is consumed locally by the people. Increased milk production through better breeding does not therefore automatically increase the farmers' income. It is a vital factor, however, in better diets for the peasants.

Telephones are nearly non-existent in the rural areas of Greece so it is necessary to go to each village every day to see if there are cows to be bred. We have six insemination routes operating at Salonica and three at Athens. These nine routes cover about seventy villages every day. The inseminators use jeeps for transportation because ordinary vehicles can not travel many of the country roads that in the summer are a foot deep with dust and in the winter a foot deep with mud. At a fixed hour the inseminator arrives at the village and all the cows are brought to a central point for insemination.

Another important service of our program is the treating of cows for sterility. Many of the cows are under-nourished and consequently it is common for them to only come in heat and have calves every other year. We have been using hormone therapy on these cows and have had excellent results bringing them into heat. Our sterility clinics have treated a total of over eight thousand cows and the results show that 80% of these treatments are successful. Approximately 40% of the treatments are for failure to come into estrus and the remainder of the cases are divided up into all the different things that are known in the United States that cause sterility and a few others thrown in for good measure.

We realize that as the farmers get better cows that they are going to have to feed them better. Consequently we are trying to de-

velop better dairy practices along with the artificial insemination program. The roughage fed to the cattle during the winter months is very poor. In order to try and get the farmers to feed their cattle better, we have distributed vetch seed for demonstrations to illustrate the value of a legume grown in their crop rotation. This legume is quite well adapted to the conditions in Greece.

No production testing has been done in Greece, but in order to evaluate the improvement in the artificial heifers over their dams we have taken milk weights on twenty-five of the first heifers to freshen in the Athens area. Their average age was 24 months at time of freshening and we found that they varied from 13 lbs. of milk daily to 38 lbs. of milk, with an average of 29 lbs. milk. These figures were taken not as their highest day, but the general average they achieved. The dams that were still in the herds when the survey was made were all mature cows, but their average highest production daily was 46 pounds and the farmers all stated that these artificial heifers were giving more milk than their dams at the same age. These records were made in commercial dairies with feeding conditions above the average for Greece but below what we would set as a standard in the United States. All calves are eartagged when born so that it is possible to identify them at a later date and to determine by which bull they were sired. We have recently imported some milk testing equipment and we intend to inaugurate a milk testing program and get records to evaluate the different bulls in our program.

The conception rate as determined by careful check of the calves born shows that about 50% of the cows settle on first service and after two services about 70% of the cows conceive. The cows that don't settle on the first two services generally have to be treated at our sterility clinic. The farmers are beginning to realize that through the artificial insemination program they not only will get better calves, but more calves, because under existing conditions they have a calf crop of only about 30% each year. The native bulls kept in the villages, especially in northern Greece, are small and scrubby. They run at will with the village herds and the resulting conception rate is low.

Greece before the war imported dairy cows for the large commercial stables around Athens from other Balkan countries. Now that the "iron curtain" has shut off this source of dairy replacements, these farmers are thinking of importing a number of purebred Swiss cows from the United States and using them as a nucleus to develop their own herds. The

cows will be bred artificially and the heifer calves will be sold to villagers to raise until they are old enough to produce. They will then be bought back by the original owners. This seems feasible and as soon as the present civil war is ended it is hoped that positive steps will be taken in this direction.

Since the program started, there have been 25,689 first services to May 1, 1949, and over 16,000 calves have been born and more are coming every day. This is nearly two times as many potential cows as have been imported since the war. These calves sired by outstanding selected sires will have a tremendous influence on the future dairy industry of Greece. Cows are being bred daily in over seventy villages and in the future it is hoped that we will be able to reach at least one-third of the total cattle population.

Brown Swiss cattle originated in Europe and now are returning to Europe from the United States. It seems only right that the continent that helped develop the big brown cow should now receive the benefits of the improvement in this breed in the United States. We in the Near East Foundation feel that this program of artificial insemination is an example of what can be achieved in a poverty stricken country at a cost that can be met by the poor farmer. Many people and organizations, both in Greece and the United States, have worked together to carry out a demonstration in livestock improvement through artificial insemination.

Liquid Nitrogen

Soil specialists of Purdue University advise farmers to keep a watchful eye on the use of anhydrous ammonia as a high-nitrogen fertilizer for direct application. With this form of nitrogen, nitrogen-deficient corn can be fertilized effectively. It may be applied at the time of plowng, while working down the seedbed, or as a side-dressing. On oats, the ammonia can be applied before seeding.

When used as a fertilizer, anhydrous ammonia is in a liquid form. Under normal pressure and temperature, it is a gas. Therefore, for this particular use it must be stored in transport under high pressure as a liquid. Tractor equipment has been developed for its application, but distribution still is limited.

—Successful Farming

If You Haven't Enough Hay

Condensed from Eastern States Cooperator

J. G. Archibald
University of Massachusetts

THERE are several areas where farmers will be short of hay, if not entirely out of it, before next spring. The first thing that comes to mind is the purchase of hay. There will be some who will be able to meet the deficit through local purchase, but in areas of serious shortage, local supplies will be of very minor significance. Most farmers in such areas must look to more distant sources of surplus hay.

Demand may exceed potential supplies, and then ways and means of making whatever can be purchased stretch as far as possible will be in order. The frugal farmer is anxious to do this anyway in order to keep as low as possible his cash outlay for such a commodity as hay, of which he normally grows enough for his own use.

Limited hay supplies can be stretched by various makeshifts, most important of which perhaps is the best possible use of other roughage which the farmer may have at hand.

Most farms have some corn fodder, and some farmers feed it to cows regularly for a time after husking, but all too often it is left in the field to freeze and gather snow. Corn fodder of medium water content (around 20 percent) has nearly as much TDN as an average grade of timothy hay, and if very dry has considerably more. The practical difficulty always is to get cows to eat a worthwhile amount of it. In years when the hay crop is short, the corn fodder should be gotten under cover before winter sets in and be run through a shredder, or at least through an ensilage chopper. Feed one feed a day of this chopped fodder, which has been moistened with molasses (three to four pounds of molasses per cow) diluted with enough water so it can be applied with a sprinkling can, and if you have never tried it before, you will be amazed at how little the cows will waste.

It should be mentioned at this point that molasses is cheaper right now than it has been for years; prices as low as 11 cents a gallon for bulk molasses have been quoted recently, which figures out to just under a cent a pound. At

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that figure, a pound of TDN in molasses is costing about 1.85 cents, in contrast with 4.37 cents in corn or 5.04 cents in oats. Molasses can be used to advantage, also, to induce cows to eat more of the poorer grades of hay, which may be prevalent during a hay shortage. It is not recommended that you feed molasses to the exclusion of grain or other concentrates just because it is cheap. There are two reasons why the amount fed should not be more than four pounds daily per cow as a maximum; it is not a balanced feed, and larger amounts may be too laxative. For the purposes and in the manner indicated, however, it has a definite place in the feeding program.

Some areas grow considerable acreages of oats for grain. In such regions oat straw can be used along with hay to stretch out a dwindling hay supply. The TDN value of oat straw is not far below that of average timothy hay (45 in comparison with 49), and while ordinarily we think of it as bedding material, it does have considerable feeding value. Here again molasses may be used as an appetizer.

There are some industrial by-products that may be purchased to help out with short hay supplies. The only trouble with them is that the supply is somewhat limited, so that when a situation arises which materially increases the demand, they become difficult if not impossible to obtain, and the price goes up, frequently to a point which makes their use uneconomical. Perhaps most important is oat feed (sometimes referred to as oat mill feed) a by-product of the manufacture of rolled oats. Extensive research has shown that this material has a feeding value about equal to a good grade of timothy or mixed grass hay, and it usually sells for around what one would have to pay for shipped-in hay. Sometimes it has had molasses added to it by the processor, which makes it more palatable and less dusty. It can take the place of half the hay in the ration, provided it can be bought in quantity sufficient to warrant feeding such amounts.

Alfalfa meal is another alternative if the price is right and if it can be bought with a maximum fiber guarantee of not more than 30 percent and preferably not more than 28 percent. The price should not be appreciably above that asked for a good grade of alfalfa hay.

Citrus pulp and beet pulp we do not ordinarily think of as hay substitutes. They contain considerably more TDN than even the best grades of hay, in fact are about midway in this respect between the roughages and high-grade concentrates, and hence are sometimes classed as "intermedi-

ates." However, they can sometimes be bought when good hay cannot be, and since they have been proved to be excellent feeds for dairy cows, to that extent they may be looked upon as hay substitutes. Citrus pulp in particular was a good buy last season; beet pulp is usually too much in demand to be an economical hay substitute.

Certain succulent feeds, too, offer possibilities. Surplus potatoes in recent years have been available rather generally for livestock feeding in New England. A bushel of potatoes has about the same amount of TDN as 22 pounds of good hay or 14 pounds of grain, but since they are essentially a starchy feed, they can be fed only as a partial substitute for either. Probably half a bushel daily would be the limit to feed to the average cow. Although they should be cooked for pigs or poultry, this is not necessary for cattle, sheep, or horses, but they should be chopped or sliced to avoid the danger of choking.

Farmers in the market garden areas frequently have opportunity to obtain worthwhile quantities of surplus or cull vegetables and vegetable wastes, such as beet tops, cabbage leaves, turnip tops, etc. In season these are excellent hay or pasture substitutes, but their watery nature needs to be kept in mind when portioning them out or when considering hauling them any distance. In general they contain around 90 percent of water, which means they have about one-eighth to one-ninth as much dry matter as hay, but it is of such excellent quality that their TDN is about one-fifth that of good hay. They can substitute for half of the daily hay allowance, which, with an average cow, and in consideration of the difference in water content and TDN, means about 50 to 60 pounds daily of such material per cow.

Cull apples may also be fed, but because they ferment very readily in a cow's paunch, the amount should be somewhat less than for cull vegetables; probably not more than 30 pounds per cow daily would be a safe rule to follow. As with potatoes, choking needs to be guarded against here also. Some farmers take care of this by feeding apples, potatoes, or turnips only when the cows are stanchioned, arranging a bar over the tie-up at such a height that a cow cannot throw back her head as she is prone to do when chewing such things.

Stale bread and other bakery waste, wet brewers' grains, wet distillers' grains and distillery slop are worthy of notice. Although primarily substitutes for grain rather than for hay, they can usually be bought at bargain prices when available at all, so they have possibilities in feed shortages of any kind. Mineral supplements

should be fed with all of them, and the watery, perishable nature of the brewers' and distillers' grains must be remembered if one is to feed them economically. Strict sanitation is necessary wherever they are fed if one wishes to avoid trouble with the local Board of Health.

Last but not least we come to the possibility of feeding more liberally of grain when hay is in short supply. All of our teaching in dairy husbandry for many years has been aimed at the ideal of maximum roughage grown on the farm and minimum grain purchases. Such practice is basically sound for eastern dairymen, but if and when hay prices get out of line and/or good quality hay cannot be purchased, it may be temporarily sound economy to feed grain more liberally than would be necessary or desirable under normal conditions. A good rule to remember is that for practical feeding purposes, good hay has about two-thirds the value of grain, so that if the price of hay this winter reaches $50 per ton, grain at $75 per ton is not out of line. This is not to say that hay prices will reach that mark in 1949–50; recollect, however, that they did in 1944–45.

A specific illustration of the hay saving that might be effected by such a change in feeding practice is appropriate here. Let us suppose for easy figuring that a man has a 20-cow herd averaging 30 pounds of milk per cow daily. Under normal conditions, he might be feeding these cows 20 pounds of hay or its equivalent and 10 pounds of grain per cow daily. A shift to 15 pounds of hay daily (i.e., a 25 percent cut) would involve an increase to around 13 pounds of grain (to be exact, 13.3 pounds). This means a saving of $5 \times 20 = 100$ pounds of hay daily, or in the course of six months of barn feeding a total saving of nine tons. The whole problem is a matter of dollars and cents; the nutritional welfare of the cows would not be endangered by such a moderate shift in hay-to-grain ratio.

There are also certain management practices that can be adopted as hay savers. Tight mangers, so constructed that a cow cannot readily push or drag a lot of hay out under her forefeet, are a help. One cannot afford to bed cows with hay at $40 a ton or more.

Usually, on every farm there is some poor-quality hay to be gotten rid of. The practice of some farmers is to feed it to the bull or the young stock, saving the better hay for the milkers but the bull and the young stock need good-quality hay as much as the milkers do. A much sounder practice is to feed out the poor stuff along with the good to all classes of

stock so that the effect of the former will be minimized as much as possible. This can be done without hardship if a little forethought is taken in haying time to keep the good hay and the poor hay in separate mows or bays so that both are accessible at all times. If only one storage space is available, the separation can be achieved by a temporary partition.

Finally, the keeping of adequate records and the culling of cows that are not paying their way, a practice which has become well nigh imperative under present-day competition, will help to save hay. The average cow in the course of a six months' barn-feeding season consumes around two tons of hay. If she is a boarder, you might better save that two tons for her hard-working sisters.

Value of Colostrum

Condensed from Pennsylvania Farmer

C. B. Knodt

THE normal dairy cow usually produces more colostrum than a calf will consume. On many farms the excess colostrum, which is that milk produced following calving, is wasted. It is important that the new-born calf get colostrum because it contains several substances which are valuable in a calf's nutrition. Colostrum contains four to seven times as much protein as normal milk. In addition, part of these protein compounds are important in that they aid the calf in fighting certain types of bacterial infections. Very little of this particular type of protein is present in the calf's blood at birth but it rapidly builds up if the animal is fed colostrum. These proteins appear to protect calves against infections which affect the digestive system.

Dairy calves are born with very low reserves of vitamin A. This vitamin is essential to the calf because of the important role it plays in the growth, health and well being of the animal. Colostrum may contain from 10 to 100 times as much vitamin A as normal milk. The amount of vitamin A present in the colostrum is determined by the amount of this vitamin present in the cow's ration. For example, cows on hay

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Pittsburgh, Pa., September 24, 1949

and concentrate feeds alone will produce milk with a lower vitamin A content than cows on pasture or those being fed silage (either corn or grass) with the hay and concentrate. In addition to the valuable protein and vitamin A content of colostrum, it is believed by some that it is of value in that it has a mild laxative effect in the new-born calf which tends to bring about a normal condition in the digestive tract.

It has been found desirable to remove the calves from the cows soon after birth and before the calf has been allowed to nurse. In this way, the calf will be easier to teach to drink than if it has been nursing the dam for several days. The calf may also nurse too much and thus take in too much colostrum. This is the cause of many cases of scours that occur during the first week to ten days. Some of this excess colostrum may accumulate in the rumen and become a putrifying mass which may result in scours and a very sick calf. In addition, it is believed that many cases of mastitis following calving may result from the injury produced by calves during nursing. The biting of the teats and the butting of the udder may result in considerable injury and thus produce mastitis.

Nearly all cows produce more colostrum than their calves will consume. This excess colostrum should not be wasted. If at all possible it should be fed to other calves in the herd or stored. Colostrum has also been frozen and stored in a deep freeze for as long as a year and found to be usable for calf feeding. It may also be kept in a refrigerator or a milk cooler for one to two days before using. Be sure to bring it up to body temperature before feeding.

Recent work by a number of experiment stations has shown that prolonged colostrum feeding can be practiced without any serious difficulties. Colostrum, preferably from a calf's dam, should be fed in limited amounts during the first three to four days at least. It may be fed during the first four to six weeks of the calf's life without any difficulty. In feeding experiments it has been found that the feeding of colostrum according to schedules recommended for milk feeding can be followed either continuously or intermittingly without producing scours. Calves can be put on and off of colostrum feeding abruptly without any apparent ill effects. Calves so fed are found to have more luster in their hair coat, make more rapid gains and exhibit a healthier appearance. Excessive colostrum feeding like excessive milk feeding should be avoided. Colostrum can be substituted for milk on a pound for pound basis

in the rations of dairy calves without any serious difficulties occurring.

When it is realized that the average cow produces 51 pounds more colostrum than is used by the calf, it is soon found that a large saving can be made by substitution of excess colostrum for milk. It would be well for every dairyman to try to use more of his surplus colostrum as a substitute for milk in feeding calves in his herd.

Do You Know How To Buy Seed Corn?

Condensed from Successful Farming

Richard Crabb

As THE Lincoln Highway heads west from De Witt, Iowa, it runs through the Green farm.

"See that field of corn?" asked E. J. Green, who with his sons Ralph and Donald raises 175 acres of corn a year. "It takes a different hybrid than the field on this side of the road. We found, by experience, that the right hybrid increased the yield from 15 to 30 bushels an acre. This extra yield means more hogs and cattle in our feedlot, puts paint on our buildings, concrete in our yards."

Then there's the case of Charles Reynolds who farms near Cordova, Illinois. He tried a lot of different hybrids before he found one he figures is worth from $1,000 to $1,800 additional income a year. "Our soil is somewhat sandy; some hybrids would not stand up against a drouth. Others wouldn't stand in the field. When we got the right hybrid, we had drouth resistance, standability, and yield, all in one package. These sandy soils are capable of producing from 80 to 100 bushels of corn an acre in favorable years, and the wrong variety can easily cost me $20 an acre on the 90 acres that we generally have in corn. With us, selecting the right hybrid is serious business," says Mr. Reynolds.

So how do you buy your seed corn? Making sure you have the best hybrids for your farm isn't an easy job. It's one you have to work on constantly. Before you start, there are two things you need to know and believe:

First, you have to recognize that

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Des Moines, Iowa, October 1949

any two strains of hybrid corn have personalities and abilities as distinctly different as any two hired men you might put to work on your farm. Second, you must keep in mind that hybrids are constantly being improved. The rate of improvement in the next few years is likely to be even more rapid than it has been in the past.

Once you recognize that hybrids are all different and that new and better hybrids are constantly being introduced, there are five simple steps you should take.

Step 1. Study your farm field by field.

What's the ground like in each of your fields? Some hybrids are noted for their performance on light or sandy soils. Others are at their best on heavy soils. Some hybrids require a field where the subsoil drainage is good, while others can do a fine job on a field nearby that has an extremely tight subsoil. Some hybrids have an almost amazing ability to utilize the extra plant food in very rich soil and convert it into extra bushels of quality corn, while other hybrids are specialists in providing surprisingly good crops on soils of lower fertility levels.

You may have great enough differences of soil texture and fertility on your farm to make it profitable to use two or more different hybrids. Intelligent selection of hybrids must begin with a careful examination of the soil on which they are used.

Step 2. Know when you wish to plant and harvest your corn.

Whether you plant your corn the tenth of May or the tenth of June, and whether you want to harvest it in August, September, October, or November are very important considerations in selecting your hybrids. In planning your next year's crop, the best course is to expect normal weather conditions.

If you want maximum yields of corn, you need the entire growing season. This means you must plant as soon as the soil is warm and dry enough, and you must not expect to harvest the crop until well after the first killing frosts in the fall. In this case, you need only consider the full-season hybrids being offered for your neighborhood.

However, if conditions on your farm make late planting, early harvest—or both—necessary, you can only afford to consider the earliest hybrids developed for your area. One of the chief advantages of modern hybrid corn over the corn we used a generation ago is that it affords a much wider range of special-purpose strains to fit into the varying patterns of farm

management. Be sure you take full advantage of them.

Step 3. Know how you'll use your corn.

Whether you market your corn or convert it into meat, milk, or eggs is another important factor in choosing the hybrids you will use. Often, farmers in the cash-corn or market-corn areas plant hybrids that will mature as early as possible so they will be in a position to take advantage of the better cash corn prices which often prevail until the corn harvest gets under way.

Even the farmers who feed their crop on their own farms need to consider what type of livestock is to be fed when they select their hybrids. Poultry farmers have found that chickens do best when fed corn of top quality, hence poultry farmers usually prefer medium to early hybrids that will offer the greatest chance to harvest corn which is fully matured and well dried.

Hogs, while more tolerant than poultry, usually eat the better-quality corn first when offered a choice. Hog farmers, as a result, can use medium- to full-season hybrids to a better advantage.

Cattle usually fail to show much interest in the kind of corn they consume. There are instances of cattle making splendid gains on black, smelly corn harvested after it had been under fall and winter flood waters for months. So with cattle farmers, high yield is apt to be more important than getting the highest quality. Hence they can afford to plant the longest-season hybrids even if an unexpected early frost should catch their crop a little off base.

Step 4. Know the hybrids of every company serving your area.

You need to know something of the hybrids offered by every seed-producing organization serving your community. First thing to do in talking with a seed corn dealer is to acquaint him with your type of soil, when you wish to plant and harvest, and how your corn crop will be used. After you have done that you are entitled to ask him three questions which should enable you to determine whether the hybrids of any particular company are of interest to you.

First, ask your seed corn salesman why he recommends the particular hybrids he does for your farm. Listen to his reasons with close attention because they will tell you whether the man is able to size up your needs and is capable of giving you the advice and service you need. Just as in buying a tractor or a truck, the service your seed corn dealer is able and willing to give is of the greatest importance.

Second, ask your seed corn

dealer if he is sure the hybrids he recommends have enough of all the characteristics which add up to high yields of high-quality corn. Pin him down particularly on the characteristics which are especially important to you, or the ones that have been of special concern to you. If you haven't been satisfied with early growth and capacity to give good field stands, if your corn hasn't stood up as well as you would like, or if your corn hasn't come through dry weather as well as you feel it should, then be sure to pin your hybrid seed salesman down on these points.

Third, ask your seed corn dealer about the corn breeding, the seed production, and seed processing work carried on by his organization. Ask him how long it has been since his organization introduced a new hybrid for your area. Ask him when he thinks his company might have new hybrids for you that would have more of the particular characteristics you want.

Ask about the seed-production and seed-processing practices of his company. How close to their seed fields do they permit other nonrelated corn to grow, from which contaminating pollen might blow into their seed crop? How carefully do they detassel their seed fields? How quickly after maturity do they bring the seed crop in?

To appreciate the importance of these questions, you need only consider the difference between buying seed corn and a pump or an ax. You can examine these products and tell something of their worth and quality. But no man living can look at a bag of seed corn and tell you what kind of corn crop, if any, it will produce. Your best clue as to the quality of seed corn is the way in which the company behind it has handled its corn-breeding, seed-production, and seed-processing programs. Find out all you can about them.

Step 5. Try promising hybrids on your farm.

From your conferences with the hybrid seed corn dealers, you are sure to find some suggestions for new hybrids that sound interesting. Plant them in limited quantity. There is extra work in making this kind of test, but you are justified in doing it because performance records made on your own farm are much more important and revealing than all other performance records combined, made elsewhere.

Be sure to mark the place where new hybrids are being grown, so you can check general performance—and the yield—accurately. You can get a satisfactory check on yield merely by harvesting 100 consecutive hills from the hybrids being compared, and weighing

the corn with any farm-type scales, making allowance for apparent difference in moisture content. Be sure that the hills checked are grown on as nearly comparable soil as possible.

These are the five steps that will give you a better chance to get the very best hybrids available for your farm. Some men who operate only average-sized corn farms figure they earn another thousands dollars a year or more because they took the time and trouble to use this formula for selecting the proper hybrids.

Barbecuing Turkey Is Fun

Condensed from Turkey World

T. C. Higgins
Rhode Island State College

It is easy and fun to barbecue turkey. The oven is simple, easily made and operated.

Two oil barrels bolted together will accommodate three 25-lb. birds. The inside barrel heads are removed. The sides of the barrels are cut partially away from the end heads so that they can be opened for ease in basting the turkeys. The distance between the top edge and fire-box edge should be about 18 inches. The top conserves and reflects heat.

The end barrel heads are cut off at the top about 16 inches above the bottom of the fire box. This height is important for proper clearance between the birds and fire, which may be further adjusted by the amount of sand spread in the fire box. Five to six inches of sand is about right. Notches for the split are cut in the centers of the barrel heads.

To make the oven more attractive and free from odors it may be burned out, steel brushed, and polished with stove blacking.

The six and one-half foot spit is made of ¾-in. galvanized pipe, drilled with 3/16-in. holes six inches apart for ample holes for the steel skewers. It has a 12-in. crank.

Two or three 12-in. skewers of eight gauge wire are used to a bird. They are put through the thickest meat, through the pipe, and bent over. In addition, new baling wire is used to truss the birds to the spit, particularly the wings,

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Mount Morris, Ill., August 1949

and to draw the thighs away from the body by wiring the hocks to the spit for good heat penetration. The pipe is run through the bird along the backbone and the tail head is wired to the pipe. Have all breasts in line on the pipe.

Valuable time may be saved by trussing the birds on the spit the day before the barbecue. By doing this, we were able to put all our birds on the fire at once at 9 o'clock, and they were ready to serve at 12:15. The barbecue sauce should be prepared the day before its use.

Important hints in barbecuing turkeys by this method—

Maintain a *very low* steady fire and *add fuel sparingly* as needed. Charcoal brickettes are the best fuel. An excessively hot fire soon makes the birds look done, but it burns the skin, dries out the meat on the outside, while the deep inside breast meat and thighs are under-done.

Keep a hoe handy to spread fresh brickettes, to rake away or to spread the fire where needed.

Turn the birds slowly and baste constantly. Use a 3-in. new paint brush, nailed to a 3-ft. stick for basting. At the start, put a little of the basting liquid inside the birds for added flavor and its tenderizing effect.

The back and thin fleshed portions of the birds will be done first. To finish the breasts and thighs, simply rock the spit slowly back and forth.

One 20-lb. bag of brickettes should cook three birds in the outfit, providing the fire has been started with a fair amount of kindling.

The secret of barbecuing turkey is an *extremely* low fire, plenty of time, constant turning and basting.

Louisiana Barbecue sauce.

For 100–150 lbs. turkey

4 lbs. butter
1 gal. cooking oil
Juice of 4-6 lemons (leave rinds of lemon in sauce).
1 bottle of hot red pepper sauce
¾ gal. tomato catsup
¼ gal. vinegar
12 tb. prepared mustard
4 lbs. finely chopped or ground onions
4 large sour pickles, finely chopped
4 bottles Worcestershire sauce
2 cloves finely chopped garlic
2 large green bell peppers, finely chopped
Salt, pepper, and other spices to taste.

Use two quarts of cooking oil to which add onions, bell peppers and garlic. Cook slowly until tender. Add all other ingredients except mustard, lemon juice, rinds, and butter. Cook very slowly until onions and peppers are well done. Stir constantly to keep from sticking. Just before sauce is taken from fire, add

lemon juice, rinds, mustard, and the remaining two quarts of oil and two pounds of butter. The oil portion of the sauce which has thoroughly been flavored with the spices and other ingredients will rise to the top. This oil is used for basting the meat while it is being barbecued. Most of the oil will be used for basting. Add the remaining two pounds of butter to the bottom sauce and check to see if seasoning is satisfactory. This thick bottom sauce is used for serving hot over the meat at the time of serving.

Do You Cheat Your Pigs?

Condensed from Capper's Farmer

W. M. McMillen
Michigan State College

SOMEBODY has been cheating his pigs. It could have been you. No? Then it must have been a neighbor. Anyway hog raisers weaned 40 to 50 million runts this year. They weighed 26 pounds or less. Runts mean just one thing—starvation.

A runt pig is one whose growth has been checked. This stunting is always due to faulty nutrition. Feeds vary in composition. That includes both grain and supplements.

A pig may be starved because its ration is deficient, or it may not get enough feed. Corn is one of the big troubles. Too much is fed. And it isn't as good in protein as it was some years ago. Vitamin and protein content of both animal and vegetable supplements may vary widely.

Milking ability of sows is another trouble. There is a big variation in the way sows raise pigs.

But how about disease, worms and bad weather? Don't they cause runts? They do but it is because they interfere with a pig's appetite or use of feed. No matter what the cause, runts nearly always have B-vitamin and protein deficiencies. The first sign of such shortages is loss of appetite. They refuse to eat even a corrected ration, so it's hard to snap them out of the stunting.

Dr. R. W. Luecke, a chemist, Dr. Frank Thorp, an animal pathologist, and the writer studied practices on 11 Michigan farms to learn what caused runts. In nearly every case too little protein

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Topeka, Kansas

and vitamin supplement were fed. In other cases trouble traced to poor pasture or none at all; lack of feeder space; running too many pigs together so that the little ones were crowded out; too little water; poor management, including a lack of parasite and disease control. I have heard farmers say many times that their pigs can't be deficient because they feed a balanced ration. What a lot of people don't understand is that a pig must eat a normal amount of even a balanced ration.

The most practical way to prevent runts is to feed the sow properly during gestation to get a strong healthy litter, and then feed her and the litter liberally to get heavy pigs at weaning time. At Michigan State we have run many lots of pigs on experiments to study diseases caused by vitamin and protein deficiencies. It has been hard to develop deficiency troubles in healthy 35- to 40-pound weanlings. It is easy to make 20- to 25-pound runts sick.

It is not hard to get a suitable ration for suckling sows. A mixture of about 75 parts grain, 3 parts mineral and 22 parts of a 35 to 40 percent protein supplement will do a good job while the sow and litter are on pasture. From 5 to 7 percent alfalfa meal should be included in dry-lot mixtures. A mixture of grains and a protein supplement containing several feeds is better than mixtures of 1 or 2 ingredients. There would be several million fewer runts each year if nursing sows were more liberally fed and the pigs creep-fed after 3 weeks. A good sow ration is suitable for creep feeding. Pigs also enjoy some cracked grain along with ground feed. A good plan is to self-feed both sows and litters.

Runt pigs get wormy or wormy pigs get runty. Good feeding prevents serious worm damage. The USDA has demonstrated that liberal skim milk feeding will worm pigs. The University of Wisconsin has shown that sheep are much more resistant to stomach worm infection when well fed. For several years we have noticed that good litters from heavy milking sows are not bothered with worms like half-starved pigs. The liberal feeding of a good ration is just as important as clean ground.

Two of the biggest causes of sick pigs are reactions to cholera vaccination and pneumonia. Several of my veterinary friends are really worried about so many pigs going bad after vaccination. About 33 percent of the pigs that come to our veterinary clinic have serious cases of pneumonia. Another big trouble is necrotic enteritis. Most of this trouble can be prevented by liberal feeding of a well-balanced mixture to sow and litter.

Other musts in producing

healthy, fast-growing pigs are parasite and disease control, comfortable quarters, a constant supply of fresh water and management that gives every pig a chance to get plenty of good feed daily.

You are going to be reading a lot about new vitamins and other developments that promise increased efficiency. I believe we are going to have more efficient swine rations in a few months. But an important thing to remember is this: It is much easier to feed breeding hogs a balanced ration than to feed young pigs a suitable one. So it is always going to pay big dividends to feed and manage sows and litters to produce heavy, strong, disease and parasite resistant pigs at weaning time. Swine producers who know how to do this just don't have many runts.

Meadows Indicate Your Soil's Productivity

Condensed from Ohio Farm & Home Research

Myron A. Bachtell

WHEAT, more than any other one crop, has tended to be used as a measure of a farmer's system of soil management. In the by-gone days when every farmer used a threshing machine, helpful neighbors all knew within a few minutes after the job was finished just how many bushels per acre the crop yielded. A cause for chagrin was 15 bushels per acre; 35 bushels created a feeling of satisfaction and 50 bushels rated several lines in the local paper.

At the Ohio Station wheat tests have been conducted for over 50 years. When the Station was established in Wayne County in 1892, three blocks of land were selected for the continuous culture of corn, oats, and wheat. These areas grew their 56th consecutive crop in 1949. Subjected to this destructive one-crop program, the corn and oats have yielded less during the latter part of this half century than they did during the first part. Though that probably was to be expected, to many it may be a surprise that the wheat, under the same rather liberal fertilizer or manure program has produced more rather than less

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Columbus, Ohio, July–August 1949

during the latter period. A partial explanation may be that rather good stands of annual yellow trefoil or black medic volunteered in the wheat during this period.

However, other blocks were selected in the early years at the Station on which wheat has been grown over the half century period in rotation with corn, oats, clover, and timothy. In a 5-year rotation one treatment was 16 tons of manure per acre divided between corn and wheat. In a 3-year rotation of corn, wheat, and clover the treatment was 8 tons of phosphated manure on corn with the wheat receiving neither manure nor fertilizer. In both rotations wheat yields have shown the same trend as they did under continuous culture; they were larger during the latter period of the tests. On the other hand, corn showed a decrease in each rotation although these decreases were much less than those which occurred under continuous culture. Moreover, the clover and timothy also showed decreased yields during the latter years of the tests.

These patterns of crop yields over 50 years seem to indicate quite strongly that, relatively, it is somewhat easier to maintain or increase wheat yields than it is to do the same thing for corn and meadows. If this is true, then wheat becomes a minor rather than a major measure of the efficiency of any given system of soil management. Over a long period of years, meadows give a more convincing answer in regard to what actually is happening to the soil.

The relative response of wheat and meadows to fertility treatments is strikingly shown in a recent test which has been conducted since 1937. The rotation in this test is corn, wheat and two years of afalfalfa-clover-timothy meadows. The amount of fertilizer applied to wheat varies from 100 to 1,000 pounds per acre. In order that the effect on the wheat might not be masked too much by the treatment on the other crops, the manure applied to corn was kept down to 6 tons per acre. Corn also received 125 pounds of 2-12-6 per acre at planting time.

The average wheat yield on the two plots receiving 500 and 1,000 pounds of fertilizer was 37 bushels during the first half of this relatively short period and 39 bushels during the latter half. Respective yields for the other crops were 88 and 76 bushels for corn; 3.2 and 2.6 tons for the first year meadow; 4.3 and 3.1 tons of hay for second year meadow. These corn and meadow reductions occurred while wheat yields were increasing.

There is considerable basis for explaining this seeming conflict of increasing wheat and decreasing meadow yields from the stand-

point of potash exhaustion, which has affected corn and meadows more seriously than it has wheat. In the last test mentioned, the soil started out to produce 88 bushels of corn, 37 bushels of wheat and 7½ tons of hay per acre each rotation period of four years. This required approximately 450 pounds of potash. Yields of the above size would have made over 20 tons of manure if all crops (except wheat grain) had been utilized as feed or bedding. The amount applied was only 6 tons. Manure and fertilizer combined returned only a little over 100 pounds of potash per acre during the four years when the crops were needing more than four times this amount. This forced a heavy drain on the soil supply of usable potash with the resulting undesirable consequences showing up through meadows rather than wheat.

The entire answer is not simple. Insects, weather, and disease merit consideration. The past season still is more or less fresh in the memories of many people. In the spring of 1949 there was warm weather early, cold and frosty weather later, many spittle bugs and drought. Such a combination was injurious to meadows under any system of farming. But over a period of years, meadows rather than wheat give the best indication of the weakness or the strength of the system used for managing the soil. Large wheat yields in themselves should not produce too much self-satisfaction with our current method of soil management.

Hogs for Profit

Condensed from Iowa Farm Science

Everett Stoneberg and W. J. Turner

Extension Associates for the Iowa Farm Business Assns.

How do hogs fit into an individual farmer's program? There's no cut and dried answer to this question. A hog production program can be varied to fit the individual farm plan—depending upon the labor, equipment and management the farmer has available.

Hogs are efficient at converting feed into meat. Feed records of the Iowa Farm Business Association members show that on the average from 1934 to 1947, hogs

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Ames, Iowa, September 1949

brought in $159 in income for every $100 of feed fed. Regardless of how you rank hogs in efficiency of converting feed crops into food, they offer the Corn Belt farmer a good way to process large amounts of corn into profits.

Hogs don't give quite as high a return for each $100 of feed fed as poultry or dairy cattle when you don't count the labor and capital needed. But one man can sell a lot more feed during the year through hogs than through the poultry or dairy cows he can handle.

That is, it doesn't take nearly as much labor to sell a thousand bushels of corn through hogs, as through poultry or dairy cows. Thus, hogs give you the chance to get a good income from each $100 of feed fed; and to have a large sale volume of business per man. And these are two essentials for making money from farming.

Generally speaking, hog raising doesn't require anything out of the ordinary in management ability. No special buying or selling skills are needed in marketing either. There's small variation in quality and no specialized market is needed. However, superior management applied to hog production will pay off unusually well.

The hog program is easy to adjust to the labor supply available. Some farmers with special skills, good equipment and plenty of labor may want to produce early spring pigs to take advantage of the higher prices of late summer markets.

This program takes more labor per litter. But it normally gives higher returns also to the skillful operator.

Pigs farrowed in May or early June will take less labor per litter. That allows the farmer to boost the size of his business. Or, he might use less total labor. But if not well organized, the farmer may not do a good job of looking after both his crops and the little pigs at the same time.

Hogs give you a good chance to inject flexibility into your livestock program. It's easy for you to adjust your pork production to your available feed supply and expected future prices. Many farmers boosted the number of pigs farrowed during the spring of 1949. This boost reflects the larger corn crop produced in 1948.

Hogs also fit in well with other types of livestock. They work in especially well with roughage-consuming livestock. Most Iowa soils need to raise some legumes and grasses to maintain corn yields. That means roughage is available on most farms.

Hogs eat mostly grain. But sheep, dairy cows, beef cows or steers can be used to eat the roughage. The result—a diversified livestock program.

This diversified livestock pro-

gram tends to spread your risk.

Hogs and Dairy. Dairy cows use lots of pasture and hay but they don't require any fixed amount of grain and their total grain needs are not large. Hogs usually pay well for the corn and some small grain and do not compete with cows for much pasture.

Since milking cows takes a lot of labor right through the crop season, the hog farrowing is usually planned to come at a time when crops do not require lots of labor. Hogs help the dairyman to get a large volume of business by converting grain into animal products with only a small amount of labor and buildings compared to the dairy enterprise.

Hogs and Beef Feeding. Beef feeding uses more grain and less hay and pasture than the dairy herd. This means that feeder cattle and hogs compete more for grain. If the farmer leans a good way toward hogs, there may be a surplus of roughage. The hog and cattle feeder often finds it to his advantage to buy more grain or else select a cattle program that will utilize more roughage.

The hog-cattle feeding farm can easily have a large volume of business. But it takes a lot of operating capital. The labor requirements are not high. So output per man can be large.

Hogs are valuable in this program because they tend to balance the risks—since cattle feeding is not always profitable. Hogs following cattle on feed utilize feed that would otherwise be wasted.

Big Pasture Farms. On farms where there is lots of pasture there must be roughage-consuming types of livestock. If only beef cows, dairy cows or sheep are used it is difficult to develop a large-volume business.

A dairy herd alone seldom fits well because of the large labor requirements. Some grain is nearly always available and the farmer is likely to find it profitable to use a good deal of it with hogs to step up volume.

If little or no grain is available some may wish to raise pigs for sale as feeders. More often, it pays to buy additional grain to fatten them out.

Most Iowa farmers find it profitable to utilize at least part of their labor and management in hog production. Some highly skilled hog producers prefer to specialize in hogs. They believe that they get a higher return for their labor and management spent in hog production than from other classes of livestock.

Your greatest single risk in hog raising is disease. But sanitation plus good management will help control disease—or at least reduce risk to a low level.

Another risk is prices. The risk here is not as great as in cattle feeding, however. Normally hogs

will at least pay for the feed they eat. The hog-corn ratio is the best measure of the profits of producing pork.

There is a rather defined seasonal trend in hog prices. The skilled producer can often take advantage of these trends to boost his profits. Outlook information is a valuable guide in hog production.

Many farmers have proven that you don't need elaborate equipment to make money raising hogs. Good equipment may make it easier, but it does not assure you success.

Capital requirements for hog production are low in view of returns expected. You can get a good profit from a relatively small investment. Thus, hogs offer splendid opportunities to the beginning farmer. He usually is low on operating capital.

About 75 to 80 percent of the cost of producing a hog is feed. And you can raise most of this on your own farm. As soon as your corn crop is produced you can step up your hog volume quickly, without investing a lot of cash.

Hogs have another advantage. The rate of turnover of capital is rather rapid as compared to other types of livestock.

Key Points in Hog Raising

Sanitation. Raising hogs on clean ground, scrubbing out the houses and washing the sow's udder all help to control disease and parasites. Using clean legume pasture will pay from the standpoint of sanitation alone.

Care at Farrowing Time. The extra pig or two saved by special care at farrowing time might double the profit from that litter. Pig brooders, guard rails and personal attention help save pigs.

Balanced rations are essential for fast and cheap gains. Pigs up to 125 pounds need more protein in the ration than afterwards.

Marketing. Profit can often be increased by taking advantage of seasonal market trends. Marketing weights should also take advantage of seasonal trends.

Quality. It is easy to obtain quality breeding stock for hog production. Select for large, fast gaining, thrifty litters. A good boar is a well paying investment.

Plan the hog program on your farm to fit your management ability and labor supply. Also fit it into the rest of the farm plan. Plan the program far enough ahead so that things are done right and at the right time.

Mechanize and Revolutionize

Condensed from American Hereford Journal

Brownlow Wilson

WITH the advent of tractor-drawn, one-man baling machines and side-delivery rakes, a veritable farming revolution has taken place. With the aid of these machines it is now possible to put up as much hay with five or six men as it was in the old days with 15 or 18 men, using horse-drawn mowing machines and go-devils.

The original baling machines required one man to drive the tractor and two men to sit, one on either side of the bale rack, to tie the bales as they were formed. As improved machines came out, it finally became possible for one man with a tractor and a baler to do the entire job; it was no longer necessary to have anyone sitting on the baler itself. In order that these machines may function efficiently, it is necessary that the hay be raked into windrows of even consistency. It was in order to assure this that the side delivery rakes were developed, and it is essential that these rakes be used for windrowing if a baler is to be used most efficiently and effectively.

These new baling machines have many advantages. When hay was put up by hand shocking, and horse-drawn machinery, obviously much more time was required to put it up than is needed when modern machinery is utilized. This meant that the hay remained down in the field longer, and if rains came, a considerable quantity of the hay was spoiled.

Under the new system, the hay can be mowed one day, raked the following day, and the baling machines can pick it up the day after that. Since it does not have to be shocked, it is never necessary to have too much of it down on the ground before it is baled. This means that much less will be spoiled if rains come while it is down.

I recently visited several ranches on which more than 2,000 tons of hay are put up during the summer. Some of these ranches accomplish this operation with a crew of only five men, incredible as that would have seemed 20 years ago.

When the hay is ready to cut, one man on a medium tractor, with a power-mower attachment,

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is sent into the field. A good man on the mower can lay down 30 or 40 acres of hay in one day. As this man moves into the next field a second man is sent into the first one with another tractor, towing a side-delivery rake. This man can actually rake almost twice as much hay in one day as the man with the mowing machine can cut in the same time, therefore two mowing machines sometimes are used ahead of one side-delivery rake.

When the hay in the windrows is dry enough for baling, which may be on the third, fourth or fifth day depending on the weather, then one fairly large tractor is sent into the field with a one-man baling machine. The driver simply drives his tractor so that the pick-up chute of the baler centers the windrows. This job requires accurate steering and, when the hay is thin, it is often necessary for him to weave the machines back and forth a bit, so that the hay is fed into the full width of the pick-up chute.

In the most highly mechanized operations, these baling machines have an elevator attachment at the back of the bale chute, which elevates the bales into a truck which follows behind. When this truck is full another one takes its place, while the first one is unloaded at the bale stack. There are certain disadvantages to this method because it means that the bales must be stacked before they have a chance thoroughly to dry out in the field.

On one ranch which I visited, the 7-L owned by the Hannas near Fountain, Colo., an ingenious home-made device was in operation. This device consisted of four 10-inch planks nailed together in front, with a four-inch gap between the middle two. A wire from each front corner was attached to a ring, which was hooked to the bale rack of the baler and towed along behind the machine.

One man stood on these boards, and as the bales were spat out by the baling machine he grabbed them with his hay hook and stacked them on the boards behind him. When he had six or eight bales stacked on the boards he picked up a bar, which lay across the boards in front of him, stuck it into the ground in the gap between the two center boards, immediately ahead of the bales, which action pushed the bales off into the field still neatly piled. Because these bales were stacked up from a two-bale base, there was less surface exposed to moisture in case of rain. On that particular ranch these bales were left out in the field one or two days, after which they were picked up by a truck and piled on the bale stack.

The Hannas also have an elevator for lifting the bales from the trucks up onto the bale stacks. The consensus of the many

farmers I consulted about these elevators seemed to be that they were nice gadgets that saved lots of hard labor but which did not save very much actual time.

Probably the best way to stack bales is to start off with a fairly large base pattern, and then step the next layer in by putting on one less bale, and so on as the stock is built up. The final result looks something like a pyramid. Most ranchers build them longer than they are wide, but when they do, most of them step in the ends as well as the sides.

When bales are stacked in a square pattern, in cubic form, some rain will inevitably seep down between the cracks and mold hay quite far down; when bales are stacked stepped in, not so many cracks are presented and less hay will be spoiled by rains. Bale stacks which are not stepped in frequently fall down at the sides in high winds, which is another reason for stepping them in. Of course, when bales are stacked inside a barn they can be stacked square, and more bales thus can be stacked in any given area.

Some farmers prefer wire-tied bales while others prefer twine-tied ones. The wire-type balers put up a tighter bale, which weighs more; however, these bales are harder to feed out, and they do not dry out quite so well. On a big ranch, when thousands of bales are being fed out each year, the disposal of baling wire becomes a major problem. In theory, it is all bundled up as the bales are fed out, but in practice, on every ranch I ever visited, there is always a lot of it around in the fields, and it has been found in some cows' stomachs, after they have died.

As opposed to this, twine-tied bales are not so tightly packed, and they are easier to feed out, because it is merely necessary to jerk off the two strings and the flakes fall apart. These more loosely tied bales aerate better, and they are not so heavy, but the twine on the bottom layer often rots out as the ground underneath gets damp.

Twine, if used, has to be of extremely high test, and one baling man told me his bill for twine came to six cents a bale, which means around $2.40 per ton. As opposed to this, baling wire costs about four cents a bale, which adds up to a considerable saving at the end of several thousand bales. Twine-tied bales, because they are more loosely packed, quite often come apart while being stacked, which is, of course, a disadvantage. The twine also frequently breaks while the bales are being tied, which means quite a few of them are spat out of the machine untied to open up on the ground. None of the new one-man baling machines is quite fool proof. When trouble occurs it is sometimes necessary to have service men come out from the

dealer. However, after the balers have been used for a year or so, the owners very often are able to train their own operators to service the machines. If the tying mechanism goes wrong, it can be corrected without having to call on the aid of a service man. It certainly pays to have such trained men, because very often the nearest service man may be 40 or 50 miles away, and after the guarantee has run out, there is a charge both for time and mileage.

Some of the brochures put out by the manufacturers claim that their machines can bale around 40 tons a day. The consensus of the very considerable number of ranchers and farmers whom I questioned seems to be that if they put up 30 tons a day, they are doing very well. Of course, they might put up 40 tons if the hay was plentiful, in even windrows on level going, and if they were able to start in early and finish late without any interruptions from rain or mechanical difficulties. However, on an average, the total tonnage per day would be much nearer 30 tons in the opinion of the people I interrogated.

Whereas it is possible to put up 30 tons of hay a day with a good stacking crew of six or eight men, the fact remains that these men cannot put up hay every day as can a baling machine. In order to keep up with the same rate of putting up hay as is now accomplished by the most modern baling methods, it would be necessary to have at least three times as many men, and probably more that that if they were using horse-drawn equipment exclusively.

Therefore, it is extremely difficult to compare the actual saving in manpower, because in the old days it was customary for the same men to mow and rake for two or three days, then to shock the cut hay for two or three days more, and finally to stack it. Under the present system which is a continuous operation, whereby the mowing machine keeps one day ahead of the side delivery rake and the rake one day ahead of the baling machine, six men not only put up as much hay as 18 could with horse-drawn equipment, but they also put it up faster.

Obviously not all ranches and farms can afford baling machines. Some of these small ranches contract their hay put up but the charge around here last year ran from $4.50 to $5.00 a ton for the balers to come in and bale it, and the ranchers still had to rake and stack the hay themselves. However, there is another ingenious invention which is being used among western farmers and ranchers. It is called a Farm Hand, which consists of a hay rake or basket, made exactly like the business end of a buck rake. It attaches to a specially built frame-

work which is mounted around any medium or heavy tractor. This, with the aid of the power take-off and hydraulic mechanism, can lift the basket of hay as high as 20 or more feet into the air after which it can be tripped to deposit its load onto the stack.

Many small ranchers, with 100 to 200 tons of hay to put up, do the job with the aid of one Farm Hand and one tractor-pushed buck rake. Of course it is necessary first to rake the hay before the Farm Hand can pick it up efficiently. Most small farmers have one medium and one light tractor, so they have the former mounted with a Farm Hand and the latter with a buck rake. If they are putting up their hay without outside help, they collect the close hay with the Farm Hand, which also hoists it onto the stack, while they send the tractor-pushed buck rake out to collect the distant loads. When the latter deposits its loads by the stack yard, then the Farm Hand picks each load up to hoist it onto the stack. Such an operation requires two men on the tractors, and two up on the stack, spreading the hay out.

Many small farmers throw in together when haying time comes around. They will have two or three tractors equipped with buck rakes out in the field and one with a Farm Hand installed to hoist the loads up onto the stack. Thus, five or six men are required, all told. Such an operation is not a continuous one, because the same men must be used to mow and rake the hay before it can be stacked. The great advantage of this system is that each farm can be operated with two or three permanent men, who work the year around. These same men feed the hay out in winter when they take it out of the stacks with the same Farm Hand, and deposit it on the feed grounds. Thus, none of the work is done with pitchforks, a job which took so much extra time in the past.

The main disadvantage of the Farm Hand is that it cannot build a stack much higher than 20 feet, and of course each stack will settle quite a bit, so the resultant height is considerably less than 20 feet. There is, of course, bound to be more spoilage in two or more low-built stacks than in one much larger stack containing the same amount of hay.

There are many other mobile stackers of diverse makes, but the Farm Hand happens to be the one in most common use in this district.

Some farmers prefer roto-balers, which put the hay up in rolled bales. The manufacturers claim that fewer leaves are knocked off when hay is rolled up rather than punched together as is done with the conventional baling machines. However, it is also true that it is harder to feed out rolled bales, be-

cause they do not fall apart in flakes after the wire or twine is jerked off. Some ranchers open the rolled bales by taking an axe and cutting half way through each bale, but, of course, this takes time.

The roto-baler has one big advantage for small ranchers and farmers in that it only costs about half as much as do most of the conventional balers. They seem to have fewer moving parts which probably means that they are less likely to go wrong. It is necessary to stop the tractor while the bale is kicked out, but manufacturers claim that it is possible to put up as much hay in one day, in spite of this disadvantage, as is possible with the conventional machines.

Many farmers complain that these bales are harder to stack, as they go to rolling unless posts are set at the end of each bottom row. This is true, but it is by no means an insuperable difficulty, and it does not involve much extra work to set these posts. However, once such posts are set, rolled bale stacks stay put even better than square bale stacks, but they do take up more room if stacked inside a barn or shed.

Some farmers and ranchers use hay-chopping machines which take the hay out of the windrows and chop it up ready for eating, after which it is blown into trucks following behind. Such hay is usually deposited in trenches, or blown into hay sheds. It is possible to take up quite damp hay in this way, which is why some farmers use this method when their hay refuses to get dry enough to bale. These choppers have one other advantage in that stemmy hay, such as sweet clover which has gone too much to stem, or even sun-flower stems, are made palatable to cattle, whereas stock scarcely would eat such hay if it were baled.

Sometimes it rains day after day, which, of course, makes it impossible to get the hay in dry. There comes a time when it must be taken in out of the field in order that the next crop may have a chance to grow. Up in Canada, they often had to stack damp hay, but as they spread it out on the stack, they salted it down with loose stock salt between each layer. It was a surprising fact that the cattle seemed to like this salted hay—although it had been put up damp—better than they did the dry hay.

Probably one of the biggest advantages of baling machines and Farm Hands and similar machinery is that they have made it possible for farmers and ranchers to do all their work with a permanent crew of men who are kept on the year around. They do not have to resort to hiring itinerant labor, often unskilled, which was becoming harder and harder to find. Married men can be hired,

since they have a permanent job; they are more contented and can be better paid and housed than was possible in the old bunk-house days. Therefore, the farming revolution has helped the hired man as much as the farmers and ranchers.

If "Colds" Are Troubling You

Condensed from Poultry Tribune

Dr. Erwin Jungherr
University of Connecticut

"Is it a common cold or something else", is a standard question of the poultryman when his birds start sneezing and coughing.

There really is no such thing as a "common cold," at least not as a flock problem. On the other hand, there occur about eight different conditions in chickens accompanied by respiratory or "cold" symptoms which can be diagnosed in the field, if typical, and by laboratory means. There probably exist some other respiratory diseases which are not well defined at the present time.

With so many conditions requiring different treatments and control, the importance of a correct diagnosis is obvious.

Constantly watching a flock for the first signs of disease is a part of good management. All "colds" start with sneezing, coughing, and rattling, particularly audible at night. Sometimes birds shake their heads, gasp for air or show swollen faces and wattles.

When you catch a bird, fluid can often be expressed from the nostrils. While you have the bird in your hands, look for tiny pock marks on the head, open the mouth in a strong light and examine for yellow plaques. Momentarily squeezing the windpipe in the upper neck often makes a rattle worse so that you can readily hear it. Any of these signs tell you that some form of "cold" is starting. What to do is the next question.

Removing the first few birds coming down with a "cold" may stop the spread once in a great while and should be given a try. In most instances, the results of culling are disappointing. This is due to the fact that the infectious agent, whatever it may be, spreads primarily during the incubation

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period, before the birds show outward signs of a "cold."

Fighting an outbreak of "colds" in chickens is often a losing battle. Still there are two important steps one should take, namely special management changes and getting an accurate diagnosis.

Management changes are designed to make the birds as comfortable as possible. In the brooder house, the temperature should be held about 5 to 10 degrees higher than normally required for the age of the chick, at least around 80 degrees F. Most important, the humidity should be stepped up by evaporating water from pans on the brooder stove or from kettles on electric elements, safely placed.

In the laying house, it often pays to put in stoves with water pans, if at all possible. But try not to get the extra heat just from closing the windows, because good ventilation is important. A good brooder fire and open windows keep the air moving and thereby sweet and clean.

Don't starve a "cold" in chickens. Good feeding is the only thing which eventually will help the birds to recover. The feed should be tempting to the appetite in order to offset loss of weight and drop in egg production as much as possible. Wet mashes or pellets for about two hours at noon after the hoppers have become completely empty, are good ways to break the feeding day and increase feed consumption.

The wet mashes are best made up with some milk product and about two percent of fish liver oil and molasses, not just plain water. A thin layer of fish liver oil can also be kept on the water provided it does not decrease water consumption.

Getting an accurate diagnosis is primarily a laboratory proposition. Although the report may be too late to help in the present outbreak, it is the only way to find out what type of "cold" you are dealing with and how to prevent it in the future.

Sometimes a diagnosis can be made on the spot by a qualified, experienced person. This is especially valuable in fowl pox and laryngotracheitis, because emergency vaccination can reduce further losses. Specific drug treatments are available for only two diseases, namely, coryza and fowl cholera. But unless one is sure of the diagnosis, the treatments are a waste of money.

Vitamin A deficiency in an advanced form may cause swelling of the cheeks and protrusion of the eyes, which lead to the name "nutritional roup." This condition is rare with modern feed mixing facilities. Swellings in the face alone do not justify a diagnosis of Vitamin A deficiency without laboratory confirmation. Treatment would be obvious.

Brooder pneumonia, due to infection of lung and air sacs with aspergillus fungi occurs mostly in young chicks, but also in growing and adult turkeys. The signs are gasping for air, moderate to high mortality, and, when opened, whitish-green, fuzzy, colonies on the air sacs covering the lung and intestine. The causative fungus may be present in the house and litter, rarely in the feed, and cannot be combatted except by a thorough clean-up job on the premises.

Bacteria-caused respiratory diseases are twofold, namely chronic fowl cholera and infectious coryza. The former is an old enemy of the poultryman because ordinary fowl cholera kills birds in a hurry, at least in 2 to 4 days.

But certain stubborn variants of the cholera germ settle in the nose and upper trachea, and cause a prolonged cold. Swollen wattles or wry necks, together with "cold" symptoms in the flock, should make one suspicious of cholera. A definite diagnosis is a laboratory proposition. It is worthwhile because 0.033 percent sulfaquinoxaline in the feed can hold the disease in check temporarily.

The other bacterial disease, infectious coryza, is caused by Hemophilus gallinarum, a close relative of the whooping cough bug. This germ was once hailed as the universal cause of "colds" in chickens but is now seen less frequently.

At first, affected birds show swollen faces due to accumulation of clear fluid in the sinuses below the eyes, rarely in the wattles. Later the fluid becomes thick, yellowish and foul-smelling, a typical picture of what used to be called "roup".

In this disease, flock treatment with one percent sulfathiazole in the mash for four days should bring about spectacular improvement. If not, it probably was not coryza. But don't expect successful treatment to bring about immunity. The disease is likely to come back.

If people hear of viruses causing disease they are often inclined to regard the cause as either unknown or due to similar agents. Although invisible except under powerful electron microscopes, viruses are great individualists which, given a chance, cause very definite diseases and immunize only against themselves.

Fowl pox is the best known virus disease. It affects chickens, turkeys, and pigeons, primarily during the cold season, but may be spread during the summer by mosquitoes. The "dry" form produces yellowish nodules which soon become crusted on the unfeathered skin, particularly the comb and wattles. The "wet" form produces clinging mem-

branes in the mouth and upper gullet. These occasionally obstruct the windpipe.

Since the course of the disease in the laying house may be long and costly, preventive vaccination is almost necessary in known affected areas. There are two types of immunizing products, fowl pox vaccine to be applied by the "stick" method and inducing a somewhat severe reaction on the birds, especially if they are not in the pink of condition; and pigeon pox vaccine to be applied by the feather follicle method and inducing practically no reaction, but also not a lasting immunity.

Regardless of preference, manufacturer's direction should be followed as the methods are not interchangeable. Following an outbreak, the premises remain infective for about 6 to 8 weeks, but recovered birds are not believed to be carriers.

Laryngotracheitis is the most severe respiratory disease from the standpoint of mortality, especially in the laying house. Typical affected birds gasp for air with wide open mouth and outstretched head, and sit back on their hocks as in exhaustion. Blood spitting may temporarily relieve the struggle. Mild or prolonged cases show watery eyes, swollen cheeks, and coughing.

Post-mortem findings are confined to the upper respiratory tract where the windpipe is frequently clogged with bloody or yellowish stringy exudate. The mouth may present yellowish slightly adherent membranes which often form a plug in the entrance to the larynx. Since there is no available cure, preventive vaccination is indispensable in known affected areas. In large flocks even emergency vaccination of the remaining healthy birds can save a good percentage. Any natural outbreak of laryngotracheitis is likely to leave carriers so that young stock must be promptly vaccinated at 6 weeks of age, as long as survivors from the outbreak remain.

The vaccine is applied with a brush on the inside of the upper lip of the vent, where successful vaccination shows a definite inflammation or "take" four days later. Proper laryngotracheitis vaccination is highly effective, the selection of flocks for vaccination depends entirely upon accurate diagnosis.

Newcastle disease and infectious bronchitis are believed to be the most widespread respiratory diseases, often occuring together in the same flock. They both affect chickens of all ages, causing mortality in the brooder house and particularly a marked drop in egg production and egg shell quality in the laying house. Chicks from recovered or immunized stock carry a parental immunity which protects them for about two and

one-half weeks. Even to the experienced observer the diseases may look alike in the field so that laboratory differentiation is necessary. However, certain signs are suggestive of the one or the other.

Newcastle disease is the real newcomer in this series of respiratory diseases but literally has taken the Nation's poultry industry by storm within the last four years. In chicks and growing birds, the respiratory symptoms are often accompanied by paralytic and other nervous symptoms in the form of contortions of the head and neck leading to star gazing and down bending.

On the inside, the only striking change is a yellow or cloudy appearance of the air sacs. Severe cases in growing birds have caused blood in the windpipe almost as in laryngotracheitis. Egg production in the laying house may drop to zero and then climb back within three to four weeks, the first eggs being chalky white, soft shelled, or bumpy.

As the disease is spread by air and other means, there is no good defense except timely vaccination. Certainly the alarm raised by the appearance of Newcastle disease and the resulting improved sanitation has not prevented its spread to any state of the union except one.

Killed Newcastle vaccine cannot bring in the disease, but it induces only a temporary immunity for approximately 4 to 14 weeks; it may have a limited place in broiler flocks, egg laying contests and under emergency conditions. As it is applied by injection into the muscle it is expensive in time and labor.

Live Newcastle vaccine is applied by the "stick" method, just like fowl pox vaccine, and has proved to be effective under proper conditions. The early fears that live Newcastle vaccine would contribute to the spread of the disease, fortunately have not materialized, provided that vaccinated birds are quarantined for about 4 weeks. In highly infected or densely stocked areas chicks should be vaccinated for Newcastle disease at 4 to 5 weeks of age. If vaccination can be deferred to 8 to 10 weeks, or when the birds are transferred to range, combined Newcastle-fowl pox vaccination may be tried without bad results. Accurate diagnosis is a laboratory job, either by isolation of the virus, or by demonstration of Newcastle virus anti-bodies in blood or egg of affected chickens.

Infectious bronchitis differs from Newcastle disease in lacking the nervous symptoms in chicks and in causing a prolonged, if somewhat less severe, drop in egg production. Thus, in the laying house, bronchitis may be the economically more detrimental disease of the two.

Accurate diagnosis again de-

pends upon laboratory procedures, which, by the way, are more cumbersome than those for Newcastle disease. There is also evidence creeping up that bronchitis may have a less known fellow traveller, tentatively called "chronic respiratory disease."

But the most important difference is that there is no commercial vaccine available for bronchitis, so that some eastern states have resorted to artificial exposure of young growing birds, either by throat inoculation or spraying with the specific virus. This can be done only if the old stock has been shown to be immune to the disease. Before this service became available, troubled poultrymen sometimes removed the windpipe from a recently affected bird and kept it well sealed, in a freezer for inoculation of the young stock the following spring.

Respiratory diseases of poultry constitute the greatest economic hazard, particularly to shell and hatching egg production. In general there are no cures for "colds" in poultry at an outbreak. Which respiratory diseases are important in a given flock or area must be determined by accurate laboratory diagnosis.

Based on the latter and in conformation with state regulations, a vaccination program should be planned ahead of time, preferably for the entire year. A timely and proper vaccination program is just as much a part of good management as sanitation, feeding and marketing.

Chicks from stock immune to Newcastle disease and preferably also bronchitis are Nature's gift to the poultryman. At the age of about 2½ to 4 weeks such parentally immune chicks become fully susceptible. Preventive live virus vaccines should be applied only to healthy stock. Undue reactions are usually due to intercurrent diseases such as coccidiosis which must be kept under control, or due to mixed respiratory infections. To know what kind of a "cold" to expect, is the mark of the poultryman of tomorrow.

Like to Weed Onions? Here's Some Good News

As most of us realize from backaching experience, the trick in growing onions is to keep the weeds from taking the crop before you do.

So the commercial onion growers are happy over a new product called Aerocuanate (potassium cyanate), made by the American Cyanamid Co.

Appled in onion fields when weeds are still small, it will reduce hand weeding by 90%. Tests on it recently were made at the University of California.

—Farm Journal

Where The Cow Waits on Herself

Condensed from American Agriculturist

Jim Hall

FOR dairymen attending the New York State Fair, one of the biggest attractions was the model one-man dairy operation demonstrating pen stabling and elevated stall milking.

The New York Department of Agriculture and Markets sponsored the model display with the cooperation of more than 20 business firms.

For the model exhibit, the State used features developed by leading manufacturers to provide for greatest economy, ease of handling and long life.

In this model layout many of the age-old ideas of dairy housing and milking have been discarded. The entire plan gives the dairy cow credit for being an intelligent animal, able to fill her own needs when the means to do so are placed at her disposal.Under the system, the cow goes to the hay, silage and water instead of having them brought to her. Roughage and water are available to her "cafeteria style" whenever she wants them.

When it's time for grain morning and night, she walks into the elevated stall to get it. While she's eating, the dairyman wipes off her bag (with paper towels from a dispenser hanging on the stall), fore-strips her and slips on the milking machine. There isn't even a pail to lift. The milk is piped directly to self-filling cans in the milkroom and these are lifted by vacuum hoist into and out of the cooler!

There is a hay-feeder in which chopped or baled hay is stored over and around a dryer-fan tunnel. Between the hay building and the central loafing pen is a paved area, where water and silage are available.

The model barn, designed with an open south side for economy in construction and operation, is of pole-type construction. Poles and splash boards around the base of buildings are chemically treated to resist decay and insect damage. The roofing is aluminum with a wide overhang at the milkhouse to keep out hot summer sun but to let the low, slanting rays of winter sun in. The large windows in the milking parlor and milkroom are thermopane insulating

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glass to minimize condensation. This glass, with a dehydrated air space hermetically sealed in, does away with the need of storm windows, practically eliminates frosting in winter and makes the window cleaning job much easier than with the commonly used windows with 9 to 12 small panes of glass to each opening.

The exterior of milkhouse and milking parlor, while it looks like clapboard construction, actually is made of concrete clapboard blocks. These are composed of two concrete slabs held together by steel rods. When the wall is up, the hollow center is filled with insulating material. The blocks are painted on the outside with Portland cement base paint. The inside may be painted or plastered.

The elevated milking stalls vary from the usual design in that they form a V with the operator working between two cows whose hindquarters are only a few feet apart. After removing the teat cups, the operator pulls a rope which opens the side of the stall away from him and permits the cow to turn and walk back into the pen area.

Chemical Frees Sewers of Tree Roots

Applications of copper sulfate or blue vitriol will free sewers of tree roots that are causing stoppages, advises R. C. Thomas, plant pathologist at the Ohio Agricultural Experiment Station.

The crushed or moderately fine crystals are easy to use, dissolve rapidly, yet lodge in the root masses long enough to be effective. The roots are killed and there is no injury to trees, Thomas reports.

Sewage organisms, including bacteria and fungi, aid in disintegrating the dead root masses which slough off and are washed away.

When a sewer becomes sluggish, 2 or 3 pounds of copper sulfate crystals may be put in through the toilet. This should be done when the flow of water is not excessive. Sometimes, after the first application of copper sulfate, the sewer becomes completely clogged after a few weeks. This occurs because the disintegrating roots cannot be carried away fast enough. They become lodged and the flow of water is stopped. When the roots have been cleared away it is a simple matter to keep a sewer in working order by adding 1½ to 2 pounds of copper sulfate every 3 to 4 weeks.

—Ohio Agricultural Experiment Station

U. S. Scouts the World's Markets

Condensed from Foreign Agriculture

Beryle Stanton
Information Specialist, U.S.D.A

FARMERS of the United States now have commodity specialists scouting the globe for them. So far 14 men have been dispatched to 47 countries to determine the prospects for American farm products in world markets.

In the course of their travels, they have gathered a great deal of information for farmers. Here is the problem they are trying to solve.

For decades, United States farmers have planted each year with the firm expectation of selling an eighth of their total harvest abroad. Then during the past 10 years they upped their production about a fourth to meet the increased needs for food and farm products from all over the world.

After the war, when Government-aid programs and war-created demands began to dwindle, barriers—many still standing—to a free and thriving export trade sprang from the shortage of dollars in some of our best foreign markets. Other blocks appeared in front of certain United States crops when convalescing countries began to grow more of the things they needed.

Many United States farmers then found themselves confronted with the fact that their world market place was in danger of becoming at least partly closed to them. For some crops, this meant serious trouble. For example, half of the cotton and rice had been moving out from the farms to mills and mouths all over the world.

To put the farmers' problem more specifically. In 1947, less cotton was sold abroad than at any time for 75 years except during the abnormal war years just passed. Apples, pears, and citrus—fruits that normally move into foreign hands in large amounts—have been staying in this country. Tobacco growers saw certain foreign countries limiting their orders for this product. And rice growers—who increased their acreage from a million to nearly a million and three-quarters to help feed the rice-eating populations of war-harassed countries—

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began to foresee a definite slackening off in demand for their crop.

All this began to add up to a serious situation, one that would probably worsen as time went on, and led the Department of Agriculture to start these fact-finding expeditions about a year and a half ago. Their aim was simple—to get the facts for farmers. Then the farmers and handlers of farm products could take advantage of all possible foreign outlets and plan their over-all production and marketing. Headquartered in the Office of Foreign Agricultural Relations, this work is being done under the Research and Marketing Act.

OFAR keeps informed on the general over-all picture for agricultural products in foreign countries, largely through reports submitted by agricultural officers stationed at various posts throughout the world. OFAR also gets a wealth of information by compiling and analyzing a mass of data flowing into the office from trade reports and other miscellaneous sources. But this information is largely of a general nature. Specific information is also needed. Fourteen men, therefore, have been working on this project of helping piece together the confused world picture.

They have concentrated on getting certain missing information vital in helping OFAR complete the complex market situation for nine separate commodities—cotton, rice, tobacco, fruit, potatoes, field crop and vegetable seeds, tree nuts, fats and oils, and fish.

This corps of scouts consists of specialists, men with long training and experience on particular commodities. Some of them work regularly for OFAR, others were drawn from other agencies in the Department of Agriculture and the Government, and still others were borrowed on temporary assignments from outside Government.

These men started moving abroad in September 1947. Soon they began sending back reports. What has been learned so far has already gone out to farmers and to processors and handlers of crops, sometimes by word-of-mouth reports from the specialists themselves when they return, sometimes in letters written informally to help farmers and handlers keep abreast of the situation, and sometimes as more formal reports issued as circulars.

Cotton—because of its importance in United States agriculture and because approximately half the crop had been going abroad in the past—was one of the first commodities to be studied. P. K. Norris, a pioneer in this kind of survey since he started looking over the world cotton situation first-hand for the

Department as far back as 1930, was one of the first men to be sent out. He went to Western Europe because that region formerly took from 50 to 60 percent of our cotton exports.

His findings showed that most countries in this area were doing the greatest part of their buying under some form of aid program. He pointed out something else, which may be found in most of the other specialists' reports—that the dollar shortage in foreign countries is primarily responsible for curtailed outlets for many of our exports. As long as the Economic Cooperation Administration continues to make dollars available for these countries' recovery, the situation will be favorable for the "essential" crops bought under it. The hope, of course, is that by the time the European Recovery Program has ended these countries will be able to begin buying on a dollar basis once more.

But Mr. Norris warned that in the meantime some of these countries are shifting to other trade areas. France, for one, has been taking considerable Egyptian cotton. Many foreign countries are also dealing on a barter basis, trading something they produce for a product of another country probably as lacking in "hard" cash as they are.

To study competition that United States farmers must face from other producing regions as well as prospective outlets, Ide P. Trotter, now Dean of the Graduate School at Texas Agricultural and Mechanical College, but at that time Director of the Extension Service, took leave from his job for a few months and went to the Orient.

He visited Japan to learn what they were doing with cotton, and China, India, Pakistan, and Greece to study cotton production in these countries as well as its use. He found cotton production on the upswing in India and Pakistan. China was beginning to grow more and better-quality cotton, some of it American varieties. Doctor Trotter told of talking with one Chinese farmer who now plants a big part of his acreage to an American variety. When asked why, the farmer replied, "The Japanese made me plant this cotton when they occupied this part of China." But once planted, the Chinese found he was getting better yield and quality, so he continued to use it.

If China could get all its cotton to its own mills, production and use would be nearly equal. In 1948, however, most of the mills were in the territory of the Nationalist Government while the cotton production areas were in Communist hands. Thus, recently, China has been a heavy user of American cotton. Future markets will depend on political de-

velopments in that war-torn country.

Trotter and Norris both report that cotton mills are bing established in the principal cotton-producing countries. In comparatively recent years, for example, large cotton textile industries have grown up in Brazil and other Latin American countries. This is also occurring in India and China. Britain, formerly our greatest taker of cotton, has been trying to build up Empire cotton production for many years, particularly in Africa.

F. H. Whitaker, borrowed from the Department's Cotton Branch of Production and Marketing Administration, spent this past winter in Europe to continue the study begun by Mr. Norris and to follow trends in cotton consumption and sources of supply for the European mills. Mr. Whitaker found raw cotton supplies inadequate in Western European countries, except in Belgium and Switzerland. Cotton consumption is expected to rise in all except the latter two countries in 1949. What these three cotton men—Norris, Trotter, and Whitaker—have learned in their studies abroad confirms the fact that cotton farmers of this country face strong competition in the future from increased foreign production and from synthetic fibers.

Because rice growers began growing so much more of their crop during the war, they have faced a particularly perplexing problem. J. N. Efferson, professor of agricultural economics at Louisiana State University, in the heart of the United States rice-producing area, undertook the study. He knew that rice now grows on 1.7 million United States acres, as compared with a prewar 1 million acres, and that rice growers now produce almost 80 million bushels yearly in contrast to 45 million before the war. Quite logically, then, the spotlight was focused on rice exports, because nearly half of the United States production has recently been going into world trade.

Doctor Efferson's job was to come back with an answer to one question for rice growers, "Will all the rice we raise continue to have a place to go at a profitable price?"

If the answer was "No," then rice growers would need to decide whether to cut down acreage if they could not find markets at home. Naturally, the whole rice industry is interested in this problem—the processors so they can plan future volume and other handlers and distributors who want to know where they can sell what farmers produce.

After Doctor Efferson came back from visiting 19 countries, he reported that, barring unforeseen circumstances, the world demand for rice would be met sooner than

had been expected. He reported a definite falling off in orders in parts of the rice-consuming regions. Rice growers in foreign countries, particularly the Orient, were beginning to get back to prewar production levels.

He also noticed some changes in food habits, such as a switch from rice to grain. For example, young people in Japan told him they had begun to like other kinds of food they were getting under United States occupation, bread and grain products particularly.

Doctor Efferson is now making a study of rice production, consumption, and trade in South America where Brazil, in particular, is a strong competitor with United States rice. Completion of this study will round out the postwar story on the world's rice situation.

The tobacco picture is relatively brighter than that for some other commodities, according to latest reports from J. B. Gibbs and C. B. Cheatham, Jr., two of the specialists who have been studying this crop. They state that smokers in many countries have acquired a taste for the American-type blended cigarette. While these men were in Europe a year ago this winter, negotiations were begun that resulted in contacts to move a sizeable volume of American leaf to Germany. Later Mr. Cheatham went back to Europe to work with tobacco manufacturers on the best way to handle and use American leaf.

These specialists also reported that some European countries—particularly France and Italy—have in the past few years increased tobacco production.

But fruit growers had a more unfavorable picture presented to them. Fred Motz came back from Europe last fall with this story. All over Europe, the time-honored fruit-bowl custom is gone. It used to be that a European reached into a bowl standing on his table or sideboard and finished his meal with some kind of fresh fruit. Mr. Motz told the fruit men, "Since the war he's been lucky to reach for bread and potatoes."

At a meeting of fruit men, some of them asked why ERP dollars were not used to buy fruit. Mr. Motz pointed out the dilemma of these countries. They only have so much . . . or so little, whichever way you look at it . . . "hard" money. All the dollars they have or earn and all the ERP dollars are being earmarked for absolute "essentials"—something to keep these countries going and to try to help them rebuild to a self-supporting basis. So far, fruit is not classed as one of these "essential" items.

And even for essentials, often a choice has to be made. He pointed to an example. The coal strike forced France to import additional coal from the United States at a

cost of several million dollars. This meant a corresponding cut in their purchases of agricultural products. France had to have this coal to keep her industrial machine running, so ERP dollars were used for coal and further delayed the rehabilitation of trade in fresh fruits.

All this means that the historical pattern of marketing United States fruit in Europe is changed for now.

Mr. Motz told representatives of the fruit industry that they could not hope to regain their markets in Europe until those countries had come much farther on the road to recovery. Nor did he believe that the industry could hope for an enlarged South American market—he had studied that possibility on an earlier scouting trip. He pointed out, however, that fruit men have 147 million customers at home since this country is one of the few with dollars to spend.

In the past, about 15 million bushels of the apple crop and 2½ million bushels of winter pears were sold outside the country. Loss of these markets is serious to United States fruit growers. Mr. Motz, therefore, went back to Europe shortly after the first of the year to continue studying the situation.

In October 1948, J. Henry Burke sailed for Europe to begin studies of market opportunities for citrus fruits and products—one phase of the fruit industry already hardest hit in some sections of the country by an afterwar let down. The story on citrus is a part of the picture painted by Mr. Motz—no dollars, no purchases and revival of the European market dependent upon the continued rebuilding of Europe's economy.

A. E. Mercker also spent several months in Europe, surveying the potato situation. On returning to the United States, he reported that even though on paper the 1945–47 export figures might seem favorable, not a single bushel of table potatoes moved from this country to Europe except under an aid or Government program.

Normally, Europe produces its own potatoes and also exports some. Since the 1945 low point, potato production there has been increasing, reaching record proportions in 1948. As to possibilities for developing any market for United States seed potatoes, Mr. Mercker reminds the potato industry of certain handicaps they have to face—high transportation costs nearly equal in some cases to the delivered cost of seed potatoes from other European countries, a rather general preference for yellow-fleshed potatoes in Europe, return to self-sufficiency in these countries, and the present shortage of dollar exchange.

Surveys of the four other commodities so far studied show that

the world is beginning to build up its production again fairly fast. Except for beans, peas, and yellow set-type onion seed, George C. Edler, a USDA man, reports that Europe has an adequate supply of vegetable seeds. He also found that, while generally in Western Europe smaller acreages of red clover seed were harvested in 1948 than in 1947 and yields were lower, the supplies of clover seed for the 1948–49 season should not be much below average. Carry-over from preceding crops will fill out the supply.

So the running reports that come in to the Washington office have by now begun to picture the world situation as it relates to export markets. Some of the news is good, some bad. But this global research job is helping to gather information on the United States agricultural crops' chances in the world markets.

Portable Elevators Save Labor

Condensed from The Southern Planter

J. L. Calhoun
Virginia Farm Electrification Council

HARVEST time is always a busy season on the farm; one that requires the best possible use of available labor. Storing the crop is often a "bottleneck" in the operation. By hand methods, it takes time and hard work to store ear corn, small grains and baled hay in barns and mows.

Many farmers have found the answer to this problem. They learned that small portable elevators, driven by electric motors, do the job easier, quicker and at less cost.

Many types and sizes of elevators are available to meet individual needs. These include the cup, blower and drag types. The cup elevator is usually permanently installed for use in a single building. It is used mainly to handle grain and shelled corn. The blower type can be moved from one place to another to elevate chopped hay, small grain and shelled corn.

The drag type lends itself to several uses. Some models will handle baled hay, bagged material, bundles of grain, ear corn, small grain and shelled corn. Most drag elevators have flights that are attached to one or two chains. The chains move the flights along a

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rectangular-shaped trough to elevate the material. They can be bought in lengths up to about 32 feet. The capacity of this elevator decreases as the discharge end is raised. This feature makes it important to obtain an elevator of proper length. They work best when the angle between the ground and the trough is 45 degrees or less. For operation at 45 degrees, the elevator should be 1½ times as long as the height of the lift. For example, if the filling door of a corn crib is 16 feet above the ground, an elevator 24 feet long is desirable.

Many drag elevators are mounted on wheels for ease in moving them around. Some have devices that simplify raising and lowering the discharge end of the elevator. Most commercial models are made up of metal for durability and long life. The size of the electric motor used varies from about 1/3 to 1 horsepower. Power requirements depend on the length and the capacity of the elevator.

Farmers often build their own elevators. Home-built elevators are not as rugged as those manufactured commercially; but many farmers are well pleased with them. In most cases, they are made of lumber with wooden flights attached to chains or rubberized canvas belting. Some are mounted on wheels; others are carried by hand from one location to another.

The speed of home-made elevators is an important factor in successful operation. For grain, the flights should travel about 200 feet per minute, and for bales, about 100 feet per minute. These relatively slow speeds require a method of reducing the speed between the motor and the elevator pulley. You can do this by using a jack shaft or a discarded transmission from an automobile. If a transmission is used, different operating speeds can be selected by shifting gears.

A ½-horsepower motor will drive an elevator up to 20 feet in length, if operated at an angle of 45 degrees or less. The motor can be placed at the upper end or at the lower end of the elevator. The drive is more efficient with the motor on the discharge end, but the elevator is more clumsy to handle. When some of the basic principles of this equipment are known, it is often possible to make an elevator from lumber and discarded material found on the farm. You can use many parts from such machines as corn and grain binders to build an elevator for very little cash outlay.

It costs very little to operate this equipment. At average electric rates, the cost of electricity will be about 10 to 20 cents per 1,000 bushels of grain handled. Furthermore, elevators do the job quickly and easily, and will help you save labor during the critical periods of harvest time.

Don't Shoot That Owl!

Condensed from The Rural New Yorker

Charles E. Booth

THE owl is one of the most valuable friends that a farmer can have. Its food consists mainly of mice, rats, moles, gophers, insects and other pests. It is one of Nature's answers to the perplexing problem of rodent control. Many farmers and orchardists have recognized owls as an asset and, as a result, have protected them and even encouraged them to make their homes within the vicinity of their farms. The once fixed idea that owls are one of the main enemies of the poultry yard is generally dying out as authentic data on the food and general habits of the various species of these birds of prey is given wider publicity.

Among the common and most widely distributed American species, there is really only one, the Great Horned Owl, that can be classed as a sworn enemy of mankind. The others are not only friends, but co-workers in the fight against rodent damage. Take the ordinary Screech owl for instance. Its quavering wail at night brings a shudder to many yet it does a tremendous amount of good by destroying numbers of meadow mice, insects and house mice. A small owl of 10 inches, it possesses an enormous appetite and should be welcomed in any barnyard.

There is another small owl which bears mentioning, the Sawwhet, which is scattered over the entire United States. It measures only eight inches, and it, too, is an excellent mouser. From its home in the dense evergreen forest, it comes nightly to visit chicken yards in search of field mice or house mice. In the fields and pastures it keeps a sharp eye out for ground moles and field moles. Numbers of these owls are killed when hunters mistake the Sawwhet for the Woodcock because of the similarity of their flight and sometimes it falls victim to its larger relative, the Barred owl. Although not a migratory species, it wanders occasionally from its usual hunting grounds and does not return for a period of years. This peculiarity has not been satisfactorily explained, but it is certain that its presence near a farmyard spells trouble for all small rodents.

Chipmunks and other forms of ground squirrels are a decided nuisance to farmers and orchard

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growers. Grain, nuts, berries, seed and nearly all types of vegetable matter form their food and, because of the wide distribution of these pests, crop losses due to their destructive qualities run into unbelievable figures each year. Among our common medium-sized owls are two closely related species, the Long-eared and the Short-eared, measuring 16 and 14 inches respectively. To them goes the credit for consuming huge numbers of ground squirrels.

Of the two, the Long-eared is perhaps the more common for the Short-eared nests somewhat farther north than the range of the former. The conspicuous ear tufts of the Long-eared give it a catlike appearance and serve to identify it. In some sections bounties are paid for its destruction; a sad fact indeed, considering that it is one of the most valuable birds of prey that we have. From a perch near its nest, which is usually built high in an evergreen, the Long-eared owl spots its prey, and many a ground squirrel bids farewell to the world on any night when this owl is allowed to roam the edges of the farm. The Short-eared prefers to build on a log in a swamp, but the habits and beneficial qualities of both birds are so similar that there is no need to list them separately. The Short-eared migrates in great numbers and such migrations are a wonderful sight to see. Flocks of more than 100 have been reported from various sections.

Many times I have watched the comical antics of the Barn owl. It is he who, possibly in his wisdom, is content to take life as it is. He never worries about a nesting site or building materials and pays little attention to what he eats. Found all over the United States, the Barn owl consumes large numbers of house mice, meadow mice, rats and moles; in the West, its menu consists of pocket gophers. I once studied the eating habits of the Barn owl at close range inside an old barn. Within a couple of hours it had caught a dozen field mice from a loft full of hay. It merely blinked its big eyes at me when I turned the rays of a flashlight upon it. Its heart-shaped face distinguishes it from the other owls but it is probably known better to most persons as the Monkey-faced owl.

The "Old Man of the Forest," the Barred owl, a large owl of 20 inches, is a beneficial species feeding upon mice, frogs, rats, lizards and insects. However, it may resort to the killing of a domestic fowl or song-bird when the weather is too severe for it to satisfy its appetite with its natural food. Aside from that, this useful bird does a good job of keeping down crop damage caused by rodents and insects. A farmer cannot be blamed for shooting a Barred owl when it does raise havoc among his poultry; on

the other hand, if he kills it simply because it is a big owl, then he is only ridding his farm of a valuable asset. Were it not for the help of these owls, a notable increase in crop destruction would be felt.

Lovers of solitude, owls generally keep to themselves and live their lives as nature intended, policing the fields, woodlands and swamps on silent wing, ever alert to the slightest sound of a scurrying rodent. Chiefly nocturnal, they work the night shift, while their daytime counterparts, the hawks, carry on during the daylight hours. This is nature's plan of balance; the birds of prey were created to play a most important role and it is up to mankind to appreciate and preserve this balance. Wanton slaughter of these birds will only lead to their eventual extinction and, once this takes place, they are lost forever.

On the other side of the fence, so to speak, is the Great Horned owl—a menace beyond any dispute. Its reputation for raiding chicken and turkey farms is outstanding and it kills game birds, rabbits, squirrels, kangaroo rats and, indeed, nearly any form of wild or domestic life that it can attack. Its nickname, Tiger of the Air, is most suitable and it deserves no other fate than to be shot on sight. It possesses none of the good qualities so evident in the characters of the other owls and, unfortunately, it is well distributed. It can be found in Eastern North America and as far west as Wisconsin, Iowa, Eastern Minnesota and Eastern Texas. In the South, it wanders to the Gulf Coast and Florida. Guinea fowl and young turkeys are among its favorite food and, to the poultry farmer, this big owl is among the worst menaces that he could ever expect to encounter. If allowed its freedom, it could, in a very short time, wipe out the entire stock of a poultry farm. The main point of confusion between this bloodthirsty owl and the Barred owl is that they are both big birds and they are both "hoot" owls. However, the voice of the Great Horned owl is a much louder and deeper one than that of the Barred owl, and it frequently utters a series of catlike calls that are unlike that of any other owl. Large conspicuous ear-tufts mark the Great Horned owl, while the Barred owl has none. So with a little study, one should be able to distinguish one bird from the other. Remarkable fellow though it is, the Great Horned owl cannot be tolerated; it is the one owl that the farmer should learn to know. Other owls have been blamed long enough for its reign of terror.

Farmers and anyone else interested in the subject of owls can obtain information about them from the United States Department of Agriculture and the Audubon Society.

Farm Accident Toll

Condensed from The Agricultural Situation

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DURING 1948, at least one resident on every six farms had an accident involving 1 day or more lost from regular activities.

Medical, dental, and hospital care from these injuries cost farm people 36 million dollars, an average of $43 per accident. This does not include the cost of accidents to those who were killed, or who suffered permanent total disabilities; or costs other than those resulting directly from the care of injuries. About a fourth of medical costs were covered by insurance.

Farm people lost 17 million days from regular activities from accidents in 1948, an average of 20 days per accident.

These findings are based on an analysis of nearly 2,000 accidents reported in three enumerative surveys made by the Bureau of Agricultural Economics in 1947 and 1948. It was the first Nation-wide sampling to determine the incidence, severity and kinds of accidents occurring to farm people. Results of the surveys provide information on accidents occurring in all months of the year.

Seventy-two percent of all accidents to farm people occurred on the farm—16 percent in the farm home and 56 per cent elsewhere on the farm. Eleven percent occured on roads or streets off the farm. The other 17 percent included industrial accidents suffered by farm people who were working in factories and accidents of children in games at school.

Fifty-four percent of injuries were sustained while the victim was engaged in farm work. Farm accidents reached a peak in September, when both farm work accidents and recreational accidents were sharply up.

Males had an accident rate over three times as great as females, and males in the age group 25 to 44 years had the highest rate.

Falls accounted for a fourth of all accidents and were the leading type in all regions. Machines and animals were next, each accounting for about an eighth of all accidents to farm people.

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Major types of accidents reported in the surveys:

Falls.—Falls more frequently resulted in disabling injuries than any other type of accident. They were second in severity, with an average of 24 days lost per accident.

Falls occuring on stairs or steps and those resulting from slipping on ice caused few disabling injuries for young people, but were important for all adult age groups. They made up a particularly large proportion of falls experienced by women.

Machines.—Tractors accounted for about 4 percent of all accidents in the surveys. Cranking tractors was most frequently reported as resulting in injuries, usually sprained or broken wrists or arms. Corn picker and corn sheller accidents frequently resulted in loss of fingers or hands.

Farm people also were injured in handling cultivators, ensilage cutters, corn elevators, manure spreaders, and various specialized harvesting machines. Other injuries resulted from industrial machinery accidents occurring to farm people working off farms.

Animals.—Horses and mules were exceeded only by autos and trucks among the specific agents causing farm accidents. Horses in relation to their numbers were responsible for the greatest proportion of these accidents. Young people were usually injured when riding horses and older people when handling them. Accidents involving cows and steers resulted most frequently from kickings.

Motor vehicles.—An average of 31 days were lost for each motor vehicle accident, and the resulting medical care costs averaged $64. These accidents were more severe and more costly than any other type. They included about a tenth of all accidents reported.

Of the auto and truck accidents, over three-fourths were non-pedestrian accidents, mostly collisions. Children were usually injured as pedestrians, often when they were going to or from school. However, a third of the pedestrian accidents happened on farms, usually when cars were backing or starting.

Handling objects.—Over half of the cases in this type resulted from lifting heavy objects, such as logs, lumber, and pieces of farm machinery. Back injuries were sustained in a great majority of the cases. About one out of 15 of these accidents caused ruptures.

Hand tools.—Axes were involved in nearly half of the hand tool accidents. The person injured was usually chopping wood when the axe slipped, glanced, or missed its object, striking his feet or toes. Knives were second in importance among hand tools causing injuries, and pitchforks third.

Stepping on or striking against objects.—Injuries from this type

were less severe than for any other type. Nevertheless, they resulted in an average of 11 days lost per accident. One out of every 6 of these occurred in the home.

Falling and flying objects.—Accidents of this type occurred most frequently while farm people were cutting trees and hauling or handling logs or lumber.

Burns or shock.—Burns or shock were the least frequent type of farm accident. However, they were third in the average cost of medical care. Young children were generally injured while playing around stoves or outdoor fires. Adults were most often injured when starting or tending stoves or oil burners. Often stoves exploded when being ignited with kerosene. Some explosions of gas stoves were also reported. Sixty-two percent of all burns occurred in the home.

The South showed the lowest rate of accidents with 27 out of every 1,000 farm people suffering an injury at some time during the year which caused them to lose one or more days. The accident rate was slightly below the national level in the Northeast, and considerably above the national level in the North Central region and West. The North Central region had the highest rate for machine and motor vehicle accidents.

Average medical costs ranged from $34 in the South to $66 in the Northeast. The low average in the South was partly due to the low incidence of motor vehicle and machine accidents, the two most costly types of accidents. However, costs of accidents of nearly all types were lower in the South and higher in the Northeast than elsewhere. The South also was lowest in extent of insurance, with 16 percent of medical costs covered. The West with 37 percent had the highest coverage.

Because of the small numbers of fatal and permanent total-disability accidents occurring on the sample farms, no reliable indications of the relative importance of such accidents could be obtained from the surveys. However, estimates of occupational accidents prepared by the Bureau of Labor Statistics indicate that in recent years there were more fatalities in agricultural activities than in any other major industry.

Nutritional Diseases of Farm Animals

Condensed from Farm and Home Science

Dr. L. L. Madsen
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ADEQUATE nutrition is an important asset in maintaining animal health. Nutritional diseases are often caused by a failure of the ration to supply sufficient quantities of one or more of the essential nutrients, or to a failure of the animal to utilize these nutrients. In cases where a ration is deficient in several nutrients, all of them must be supplied before optimum results will be obtained.

Many laboratory methods have been perfected for the detection of nutritional deficiencies, but the recognition of specific symptoms in animals is still the most widely used means of diagnosis. In this short review only a few of the important nutritional diseases can be discussed.

VITAMIN A DEFICIENCY

Farm animals of all ages may suffer from vitamin A deficiency, but young animals are particularly susceptible. New born calves have low vitamin-A reserves since the pregnant mother, even on a high carotene intake, does not supply vitamin A to the fetus much faster than it is needed. Cows receiving an insufficient amount of vitamin A may abort or have calves that are weak or blind at birth. Such calves may die within a few days; however, the cows themselves often appear normal, except for a possible increase in number of retained placentas. Diarrhea (occasionally constipation), pneumonia, blindness, dilated pupils, convulsions, kidney damage, incoordination, rough coat, failure of appetite, and a slow growth or weight loss followed by death are characteristic of vitamin-A deficiency in calves.

One of the first symptoms of vitamin-A deficiency that can be detected by a careful observer is night blindness, or an inability to see well in dim light, such as during the late evening. This can be detected by driving animals about in a corral and noting if they stumble over, or bump into, objects placed in their way.

Various degrees of night blindness can be detected, and the condition usually gets progressively worse. Night blindness may progress to permanent blindness, caused by optic nerve injury, if the deficiency continues in young animals. Blood analysis for carotene and vitamin A also proved to

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be of value in diagnosing vitamin-A deficiency in cattle.

Bulls may lose their reproductive ability in severe vitamin-A deficiency, but damage to sexual organs is not always permanent. In a recent study, young beef bulls were subjected to a period of vitamin-A depletion by feeding a ration low in carotene. It was found that sexual activity and ability decreased rapidly with the development of symptoms of vitamin-A deficiency. Semen samples, collected as the depletion progressed, showed marked increases in percentage of abnormal spermatozoa and cellular debris with progressive decline in motility.

Fattening and breeding cattle often develop swelling of the legs, shoulders, brisket, hindquarters, and elsewhere when suffering from advanced vitamin-A deficiency. The swelling disappears quickly when a good source of carotene or vitamin A is provided.

Sheep also develop night blindness from vitamin-A deficiency and pregnant animals may abort or give birth to weak offspring which die shortly afterward. Other symptoms in sheep are loss of appetite, poor condition, and weakness.

Swine show incoordination and convulsions similar to calves on a vitamin-A-deficient diet. They also may have impairment of vision. Vitamin-A-deficient sows may fail completely in reproduction or give birth to blind or eyeless pigs. Other congenital abnormalities noted in young pigs born to vitamin-A-deficient sows are cleft palate, harelip, accessory ears, misplaced kidneys, and subcutaneous cysts.

Horses on vitamin A deficient rations have rough, scaly hoofs, a rough coat, and develop night blindness.

A lack of sufficient carotene in the diet is the most common cause of vitamin-A deficiency in farm animals. Conditions under which this deficiency appears most frequently in cattle are (1) on the range during drought; (2) in the feedlot when consumption of concentrates is high and the supply of roughage is either low or of poor quality; (3) wintering animals on low grade roughages such as straw or poorly cured hay; and (4) calves fed skimmilk or calf meals without good hay or other source of vitamin A. Good pasture or properly cured hay of the current season's crop during dry-lot feeding will prevent or cure this deficiency. The National Research Council recommends 5.5 mg. of carotene or 3,000 I.U. of vitamin A daily per 100 pounds live weight for cattle for moderate storage and reproduction.

Vitamin B Complex

The number of recognized components of the vitamin B complex

has increased steadily since 1926. Much is known concerning the essential nature and deficiency symptoms of these vitamins in the diet of laboratory animals and poultry. Recent studies have also shown that most of these factors are essential for normal growth and health of swine, and that a deficiency of these factors produces typical symptoms. A definite dietary requirement for the individual B vitamins has not been established for cattle, sheep, and goats, however.

Studies on the vitamin-B complex requirement and effects of this deficiency in swine have been carried out largely with purified or restricted diets. A need for thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, choline, and several other factors has been established.

Thiamin Deficiency—Thiamin deficiency can be produced in young pigs by feeding rations deficient in this vitamin. Symptoms appear after the pigs have been on the diet for several weeks. The animals first refuse food, may vomit occasionally, and finally become emaciated. There is also a marked lowering of body temperature and pulse rate. Death usually occurs within a few weeks unless thiamin is given. On autopsy, a flabby heart and liver damage are often found. Some individuals have excessive fluid in body cavities and pathologic changes in the gastrointestinal tract. Changes have been reported on the heart and liver. Studies reveal a lowered heart rate.

Thiamin is also needed by sows for successful reproduction. Results of recent studies at Washington State College with sows on thiamin-deficient diets may be summarized as follows: Gilts farrowed nine to eleven days prematurely, high mortality in newborn pigs, weak leg condition in pigs at birth, and unthrifty pigs and low weaning weights.

It is fortunate that practical swine rations are usually well fortified with thiamin when they contain a large proportion of whole grains and grain by-products.

Riboflavin Deficiency — Riboflavin deficiency has been produced experimentally in swine by feeding rations low in this factor. The following symptoms have been noted: slow growth, frequent scours, walking with difficulty owing to a crippled condition of the legs, and rough skin and coat. Failure in reproduction was also noted by the Washington State College workers. They report that riboflavin-deficient gilts farrowed four to sixteen days prematurely: a loss of appetite with poor gains during gestation; pigs died at birth or failed to survive more than forty-eight hours; and abnormalities such as enlarged front legs, generalized swelling,

and hairlessness were evident in baby pigs.

Riboflavin may be supplied to swine in milk by-products such as skimmilk, buttermilk, and whey. Green pasture and well-cured alfalfa are also good sources. Grains are relatively low in this factor but liver meal, yeast, and dried distillery solubles are rich sources.

Niacin (Nicotinic Acid) Deficiency—Swine require niacin, but recent findings indicate that they can apparently get along without this vitamin if the ration contains adequate amounts of the amino acid, tryptophane. Niacin deficiency is characterized by poor appetite, slow growth, frequent diarrhea, necrotic lesions in the large intestine, and a high mortality if the deficiency continues.

Barley usually contains more niacin than corn. Fresh liver, liver meal, and yeast are good natural sources of the factor. Successful use of pure niacin in the treatment of necrotic enteritis in swine has been reported by Michigan and Pennsylvania workers and by several practicing veterinarians, but the problem is still controversial. More work needs to be done in this field in order to define more clearly the interrelationship between diet and susceptibility of swine to organisms causing necrotic enteritis.

Pantothenic Acid, Pyridoxine, and Incoordination in Swine—As early as 1916, Wehrbein, of Iowa, described a posterior paralysis and incoordination in swine. Work in recent years by the U. S. Bureau of Animal Industry demonstrated that the incidence and severity of the disease could be increased by heating the ordinary swine ration to 115 to 120 degrees F. for thirty to forty hours. Later work showed that pantothenic acid was the preventative factor that was destroyed by heat treatment. Studies with purified diets demonstrated this relationship further and revealed that another B vitamin, known as pyridoxine, was also involved. Symptoms of pantothenic acid deficiency are striking. Pigs lose their appetite, slow up in gains, then lose weight, and die. They also have severe diarrhea (frequently bloody), loss of hair, weakness, and incoordination.

Pyridoxine must also be present to prevent nerve degeneration in pigs on a synthetic diet. This factor, however, does not seem to be the limiting one in natural diets.

Barley, oats, liver, brewers' yeast, and concentrated milk products contain protective factors against nerve degeneration in swine. Treatment of pigs with incoordination is usually unsuccessful because nerves with this type degeneration do not repair themselves to any great extent.

Choline Deficiency — Choline deficiency has not been reported in

swine fed natural rations, but from studies with purified diets it is obvious that a deficiency of this factor can readily be produced. The most striking symptom is the development of a fatty liver. Work from Washington State College demonstrates conclusively that choline is needed for successful reproduction in swine. When gilts were maintained on choline-deficient diets they farrowed on schedule but there was a heavy death loss among the pigs and those that survived for a time showed leg weakness, muscular and nervous incoordination, subnormal weaning weights, and, at autopsy, typical fatty livers were found.

Phosphorus Deficiency

Beef and dairy cattle and sheep show symptoms of phosphorus deficiency in many areas and under various feeding conditions in the West. Typical manifestations of phosphorus deficiency include depraved appetite, emaciation, stiff joints, irregular estrus, small calf drop, and low weaning weights on calves. Studies at the Utah Station show that parturient hemoglobinuria or nutritional red water, in high-producing dairy cows, responds to intravenous injections of disodium phosphate and to drenching with this material or bone meal. Reports also show that beef cattle on feed are responding to phosphorus therapy in cases of nutritional red water. This type of red water should not be confused with the highly fatal, infectious bacillary hemoglobinuria.

Livestock men in the West are beginning to depend on phosphorus supplements such as bone meal or a mixture of equal parts of bone meal and salt to prevent phosphorus deficiency.

A story about one Utah sheepman illustrates this point. In 1940, he took over a sheep outfit which had failed financially. He soon noted ulcerative arthritis in his lambs. Losses varied from 50 to 100 lambs per 1,000 ewes. Losses from poisonous plants, particularly sneezeweed (Helenium hoopesii), also made it necessary for him to move the herd to browse about every three weeks and stay there for three or four days. He was advised to feed a mixture of equal parts of bone meal and salt. Within five or six days, losses among lambs stopped and many of the cases of ulcerative arthritis cleared up. Bone meal feeding continued and, in succeeding years, it was noted that the lamb crop increased, weaning weights were heavier, ulcerative arthritis disappeared, and gradually it became evident that it was no longer necessary to go to browse to control poisoning from sneezeweed. The sheep became more contented, grazed more uniformly, and were in better condition.

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—Wellington Brink in Soil Conservation